

The MINING CONGRESS JOURNAL



Volume 13

APRIL, 1927

Number 4



A NEW ERA-CONVEYOR MINING



Sole American Agents

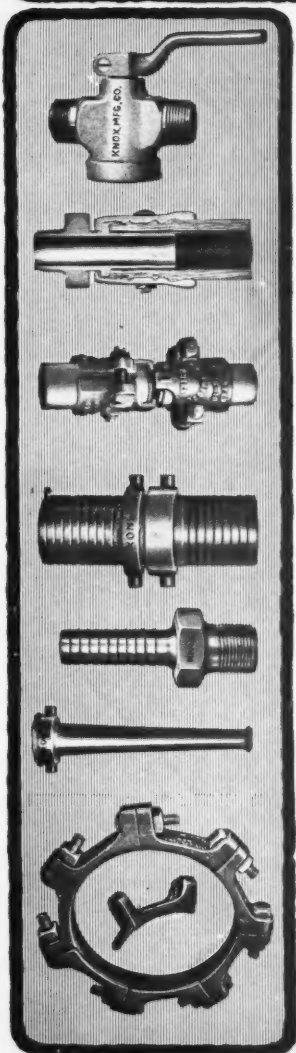
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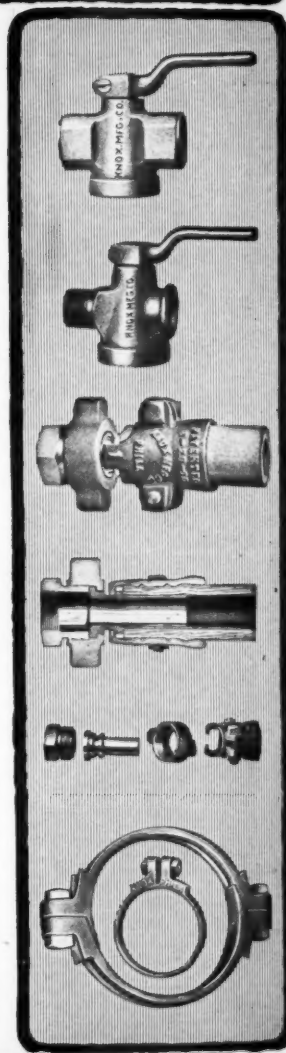
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Blackwood Mine



Blackwood Coal and Coke Co.
Tipple at Calvin, Virginia



Revolving Dumps

Dumping problems at many mines have been solved by the use of the Rotary Car Dumper.

Where old equipment has been replaced with a Rotary (R and S) the cost of dumping has been reduced. In some cases enough to pay for the installation in a year's time. In instances where the capacity has been subject to the speed of the dumping operation the Rotary has increased the mine capacity.

In the United States and Canada many of these Rotary Car Dumpers are in daily use. They empty cars ranging from the smallest mine or quarry car to the largest railroad gondola, and clean them whether the material is sticky or dry.

If you have a varied assortment of mine cars, the same Rotary will take care of all, at the same time making it possible for you to buy cheaper, longer-lived, solid-body cars in the future.

One man usually controls the dumper and handles the cars. The power used may be either electric, air or steam. Gravity if desired.

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THE MINING CONGRESS JOURNAL

APRIL, 1927

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PRACTICAL OPERATING MEN'S DEPARTMENT

METALS

Steam Shovel Problems at United Verde

New Concentration Plant at United Verde

Shaft Construction Methods at United Verde

COAL

Mechanical Loading in Narrow Work

Timber Preservation and How It May Profitably Be Applied To Coal Mining

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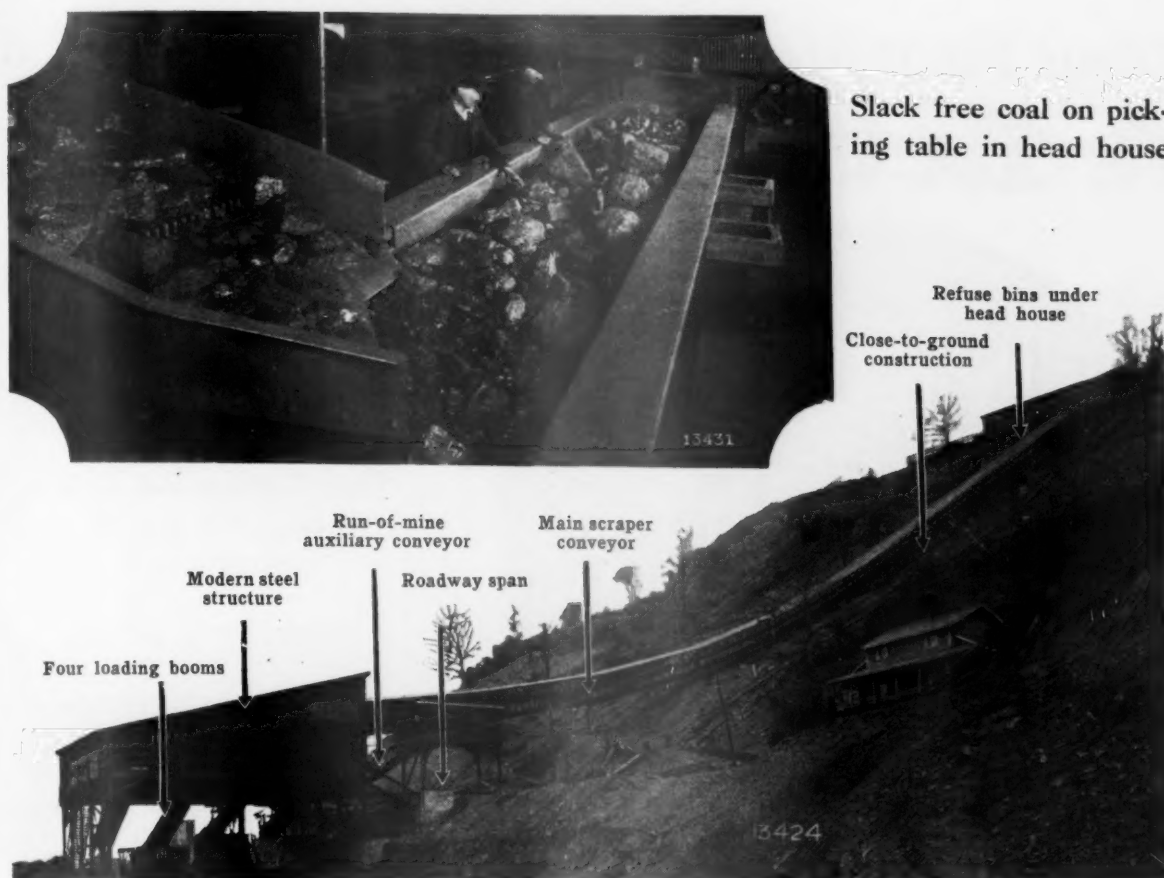
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All Steel 1500 Ton Tipple

Fifteen hundred tons of No. 3 Pocahontas go over this tipple every day at the Arlington Coal and Coke Company's Mine in West Virginia.

At the head house the slack is screened out ahead of the picking table, making clean picking easy.

This slack is put back with the clean coal on the main scraper conveyor.

In the screen house below, four loading booms deliver lump, egg, nut, run-of-mine or any mixture.

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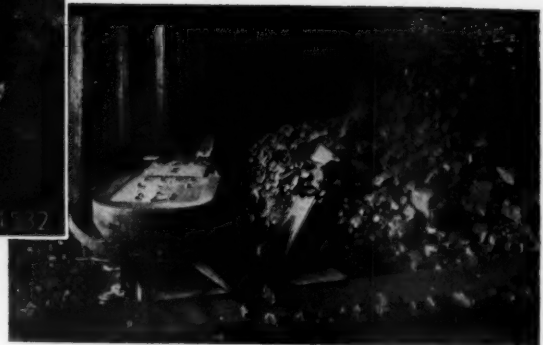
Long Face Mining with the Conveyor-Loader A Better Grade of Coal



*The Jeffrey 44-B
Conveyor Loader*

The photograph above shows the 44-B Conveyor-Loader advanced in an irregular outline to follow the contour of the shot coal.

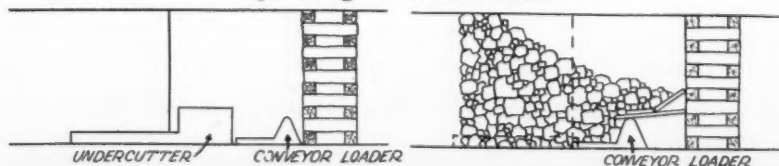
At the right the Conveyor-Loader is discharging to a 47-A Sectional-Conveyor.



Operating in a 3 Foot Vein



Operating in a 6 Foot Vein



These diagrams illustrate how the Conveyor-Loader operates in a 3-foot and 6-foot vein. The space between the coal and posts is from 5 to 6 feet. A Longwall Machine does the undercutting and the Conveyor-Loader is placed directly behind it.

JEFFREY

de r Means—

Coal at a Lower Cost

ON a long face having a free end less powder is required to shoot coal than is necessary for a short face that is tight at both ends. There is less shattering of the coal, resulting in a better grade of large lumps.

To secure the greatest return from concentrated working, the coal should be loaded out quickly. This is best accomplished by means of a conveyor that remains close to the face, thus permitting close timbering which eliminates the uncertainties of roof control.

Being narrower than any other device available for loading out coal, the Jeffrey 44-B Conveyor-Loader meets these requirements, but further than this, it is so constructed that it will not be damaged by any reasonable fall of coal, rock or slate. The rock can be conveyed away immediately and the conveyor is again ready to load out the coal.

The Conveyor-Loader will load out over half of the coal without shoveling. Coal can be shot directly onto the conveyor. After the coal, which falls on the conveyor, has been loaded out the conveyor can be moved forward, making it unnecessary to carry that portion of the coal which must be shoveled. Large lumps can be rolled on without lifting them.

Its flexible design permits the conveyor to follow closely the irregular contour of the shot coal.

This machine cannot be overloaded. It positively carries away all coal at as fast a rate as it can be loaded onto the conveyor.

The Conveyor-Loader carries the coal to a 47-A Sectional Conveyor which, in turn, empties into a train of cars on the entry.

Use of the Conveyor-Loader results in a reduction of the cost per ton in two ways:

First—Direct cost of labor to cut, drill, load, and convey the coal is reduced by increasing the average output per man. This saving is considerable even after making ample allowance for depreciation, maintenance, and interest on investment.

A very substantial saving is also made in general maintenance cost. The actual working area is cut to a small fraction of that required in ordinary room and pillar systems for the same tonnage. This reduces the cost of ventilation, drainage, trackage, keeping haulage ways open, timbering inspection and other items of overhead cost.

We will be glad to send you further information, or if you desire a Jeffrey Sales Engineer will go over your mine with you to determine your possible savings with the Conveyor-Loader.

Other Jeffrey Equipment for Concentrated Mining is shown on the next page

Coal Mine EQUIPMENT

Other Jeffrey Equipments for Concentrated Mining



The Shortwaller—For use in room or entry. Cuts, loads, and conveys. Stays right on the job until room or entry is worked out. Operates continuously, except during shooting. In the above illustration the machine is shown ready to load across face.



Sectional Conveyor—Carries coal from Shortwaller to a fixed loading point where it discharges into mine cars. Made in 6 ft. sections to follow steady advance of mining machine. In long face mining coal is received from Conveyor-Loader and carried to cars on entry.



Portable Conveyors—for service between Shortwaller and Sectional Conveyor when drawing rib or working in wide rooms, also used as face conveyor for hand loading. Built in two types: Belt Construction for hand loading and Chain Construction for machine or hand loading.



Pit Car Loader—for rooms where delays due to taking down top rock, etc., make use of a more complete system of loading machines and conveyors impractical. Three times as much coal can be loaded with this machine as by shoveling direct to cars.

Catalog No. 425-A completely describes these Jeffrey Equipments for Concentrated Mining

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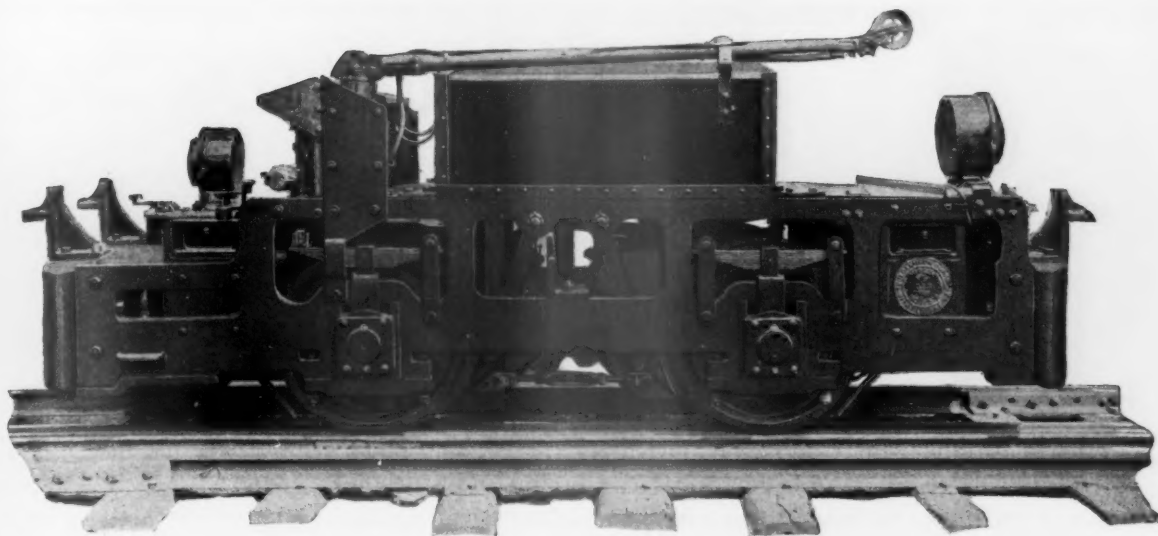
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Drills
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Sectional Conveyor
Pit Car Loaders
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Crushers

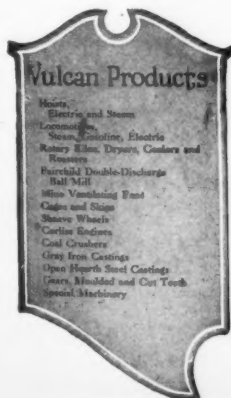


This combination locomotive, too, is equipped with the—

3-point Suspension

The new Vulcan Combination Trolley and Battery Locomotive is built with the same equalization of pressure on the journal boxes as are the other Vulcan Electric Locomotives. Hence it rides smoothly over uneven tracks found near the face. Road shocks are absorbed by a type of spring suspension found only in the Vulcan design.

If smooth running interests you, plus low maintenance costs, unusual power and ease of operation—it will pay you to send for the complete facts about the Vulcan Combination Electric Locomotive and the other Vulcan Electric Locomotives---Trolley and Storage Battery types.



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SOME AIDS TO

IN addition to the standard explosives, with which every user of powder is more or less familiar, the Hercules Powder Company has developed special types of wide adaptability that sometimes reduce costs from 10% to 30%.

The standard list includes L. F. Straight Nitroglycerin, Extra L.F., Gelatin L.F., Gelatin Extra L.F., Blasting Gelatin, Contractors' Dynamite, and Blasting Powder. Nearly everyone in the explosives consuming industries is familiar with these. Information about them, however, will gladly be supplied anyone who wishes it.

Foremost among the improved explosives that have been developed by Hercules chemists are the Specials, Nos. 1, 2, and 3. These powders are among the safest on the market, because they are less sensitive to flames, sparks, friction, and impact than other dynamites.

Specials Nos. 1 and 2 were the first introduced. These proved so successful and economical for open-pit mining and quarrying that No. 3 was



Hercules Blasting Caps are made in two sizes, No. 6 and No. 8, No. 8 having twice the explosive charge of No. 6.



Herco-Blasting Powder, used in Hercoblasting, the blasting method described below.



Hercules Specials Nos. 1, 2, 3 are among the most important of the improved Hercules explosives. They have effected savings as high as 30%.



David Hinkle was born at Upper Lehigh, Pa. He has worked in the mines 13 years.

developed in response to many requests for a powder that would offer the same marked advantages in underground work. These specials usually replace 30% to 40% Extra L.F., and where they are suitable, they show an appreciable saving.

Herco Blasting Powder is a special black blasting powder recommended for Hercoblasting, the blasting method which consists of shooting blasting powder column-loaded in well-drill holes with Cordeau-Bickford. Where this method can be used, black blasting powder replaces dynamite at a saving often as high as 35%.



The galvanometer is a valuable instrument for testing electric blasting caps and circuits.

HERCULES

*Dynamite—Permissible Explosives—Blasting Powder
Blasting Supplies*



For 35 years Henry Otterbine has been engaged on work where explosives are used.

BETTER BLASTING



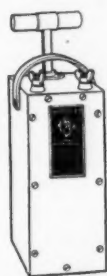
Elof Nelson has been a Hercules powder man for 30 years. He transports nitroglycerin to the powder line.



THE Hercules Powder Company supplies all the accessories used in blasting. The Hercules 1 to 50-hole, the Hercules No. 2 (1 to 10 capacity), and the Hercules Midget (1 to 5 capacity) Blasting Machines have been greatly improved and are far superior to the old type. With the new 50-hole machine, the blasting circuit is closed at the instant of maximum voltage and amperage, and the current is maintained in the circuit for an appreciable length of time. This machine has fired up to two hundred electric blasting caps connected in series, and the No. 2 machine has fired 30 caps. The capacities are rated at 50 and 10 caps respectively, thus allowing a large factor of safety. Furthermore we do not recommend connecting more than 50 electric blasting caps in a series.



Hercules Blasting Machine, 1 to 50-cap capacity.



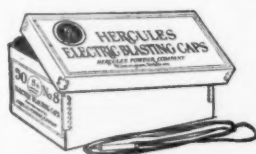
Hercules No. 2 Blasting Machine, 1 to 10-cap capacity.



Hercules Midget Blasting Machine, 1 to 5-cap capacity.



A Hercules Rheostat is valuable to the blaster in testing the capacity of his blasting machines.



Hercules Electric Blasting Caps are also made in two strengths, Nos. 6 and 8. They are dependable and have several distinctive features.

Hercules Blasting Caps and Electric Blasting Caps are charged with a fulminate of mercury compound. This costs more than other practicable materials. But it is better. Caps charged with it are more dependable. Hercules Electric Blasting Caps have a larger diameter and are shorter than most caps. This gives a more concentrated charge. The larger diameter also makes possible electric caps with a better mechanical assembly. Bridge wires are made of platinum-iridium; broken bridges are practically unknown.



Michael Davitt, chemist, has been with Hercules for 10 years. He is engaged in testing Hercules Products.

*Write for a copy of a new general catalogue
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Explosives and Blasting Supplies*

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60 cars

150 cars

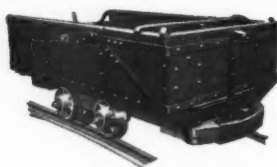
150 cars

100 cars

100 cars

100 cars

The Continental Coal Co. has now placed seven successive orders for Timken-equipped cars. In this way many great operators have built up their fleets of thousands of Timken-equipped cars.



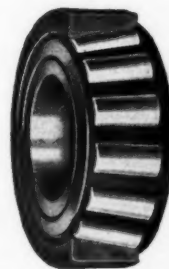
7 Successive Timken Orders

One order for Timken-equipped mine cars very often means that every other type of car will shortly be displaced! Timken operating records leave no other logical choice. Anti-friction economies are not alone responsible, even though Timken anti-friction showings are best, as proved in latest impartial tests.

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THE TIMKEN ROLLER BEARING CO., CANTON, OHIO



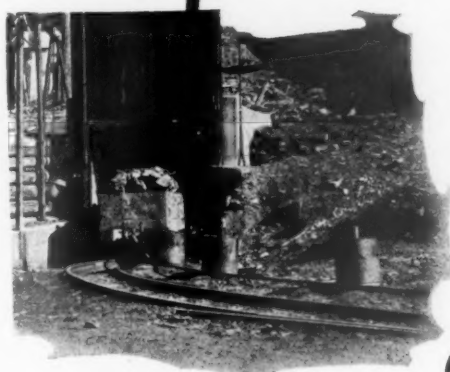
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TIMKEN
Tapered
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Steel



Wire
Rope



IS used where equipment is purchased on the basis of lowest ultimate cost over a long period of years. It is constructed to withstand the strains, abrasion and sudden pulls to which mine ropes are subjected and is the choice of particular engineers because of its dependability. There is a Roebling Rope for every purpose.

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6 sizes
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Various sizes and types
from 89 lbs. to 210 lbs.

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Various sizes and sections
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lengths

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Starting a new round in a four-foot seam of coal. The BBR-230 "Jackhamer" is the ideal drill for coal mine work.

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The successful mines—the leaders in the field—are the ones that have carefully studied all available equipment and methods and have standardized on the best of both.

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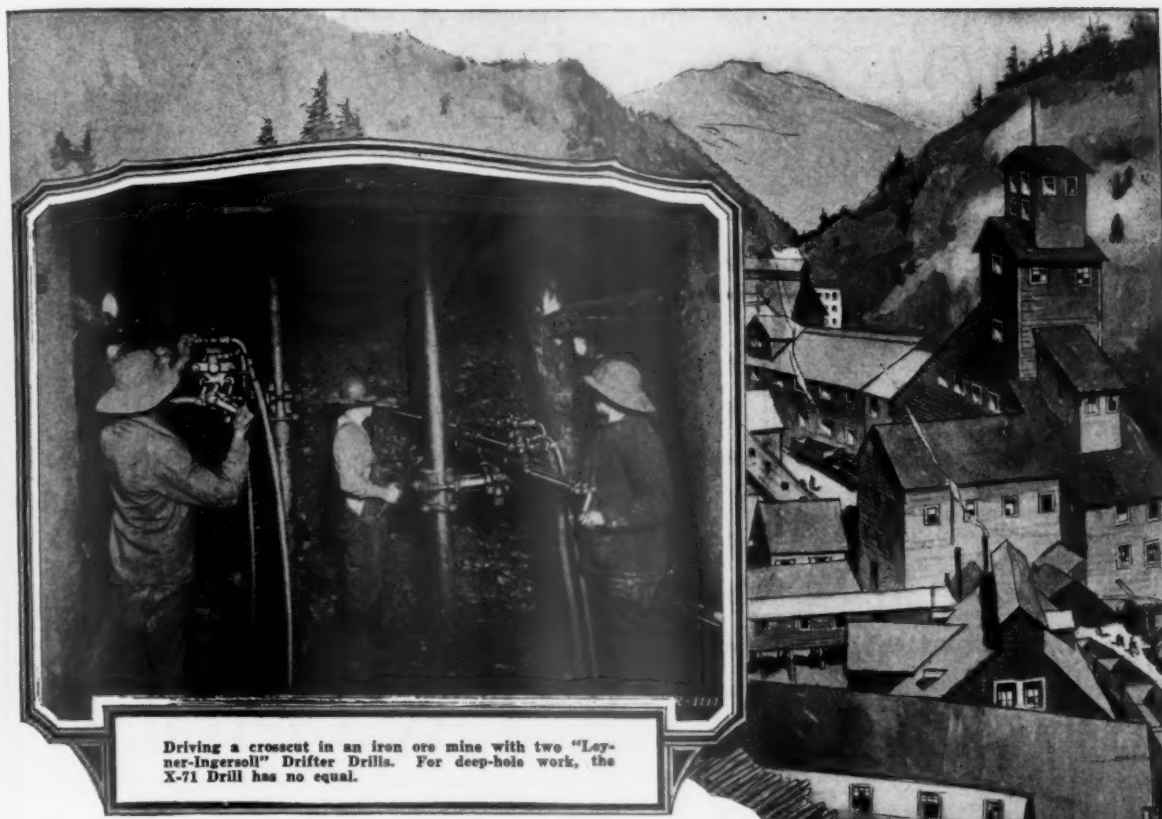
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Driving a crosscut in an iron ore mine with two "Leyner-Ingersoll" Drifter Drills. For deep-hole work, the X-71 Drill has no equal.

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cause Ingersoll-Rand has been the leader in the mining machinery field for many years.

For over half a century, it has been the Company's constant aim to furnish the mining, contracting, and quarrying industries with superior drills, compressors, sharpeners, etc. Each year Ingersoll-Rand Company spends in research and experimental work on these products five times as much money as it spends in advertising them.

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2 sizes

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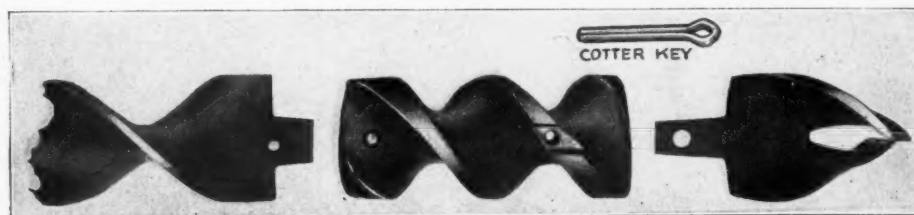
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Write for free samples and descriptive literature

JOS. McLAUGHLIN COMPANY, Joliet, Ill.

DIAMOND DETACHABLE

AUGER BITS

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American Wire Rope

AND

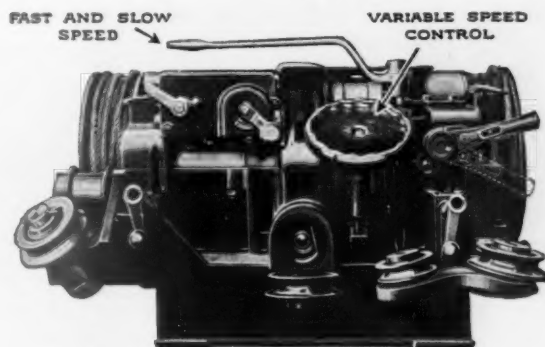
AERIAL WIRE TRAMWAYS

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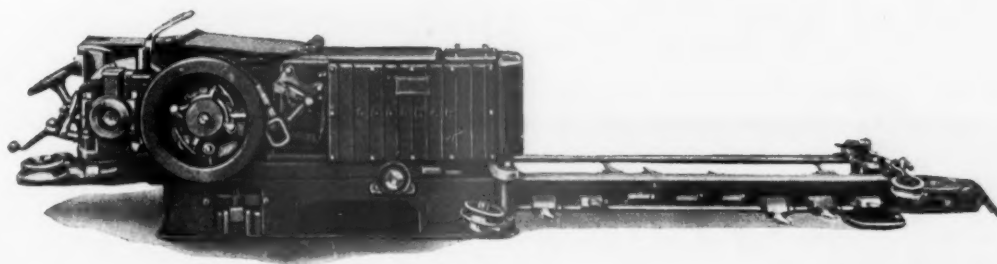
American Steel & Wire Company

Chicago-New York

The
Only
Shortwall
Built with
High and Low
Variable Speeds
on both
Power-Driven
Rope Drums



The
Universal
Control
Goodman



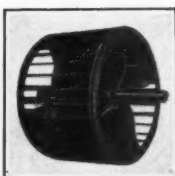
All Movements are under this
UNIVERSAL VARIABLE SPEED CONTROL

1. Unloading
2. Dragging to face
3. Sumping
4. Cutting across
5. Dragging back
6. Reloading

Important for Safety and Efficiency

Built to meet the Requirements of Simplicity and Power
—A machine Easy to operate and Easy to control—

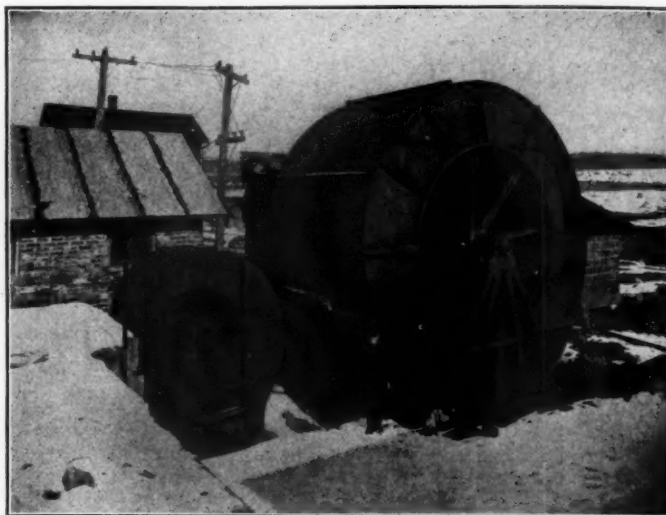
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WHEN changing from steam to electric drive consult Robinson Ventilating Company. They can cut your power bills.



16 ft. Robinson Steam Driven Steel Plate Fan replaced with a 6 ft. Robinson Electric Driven Turbine Fan

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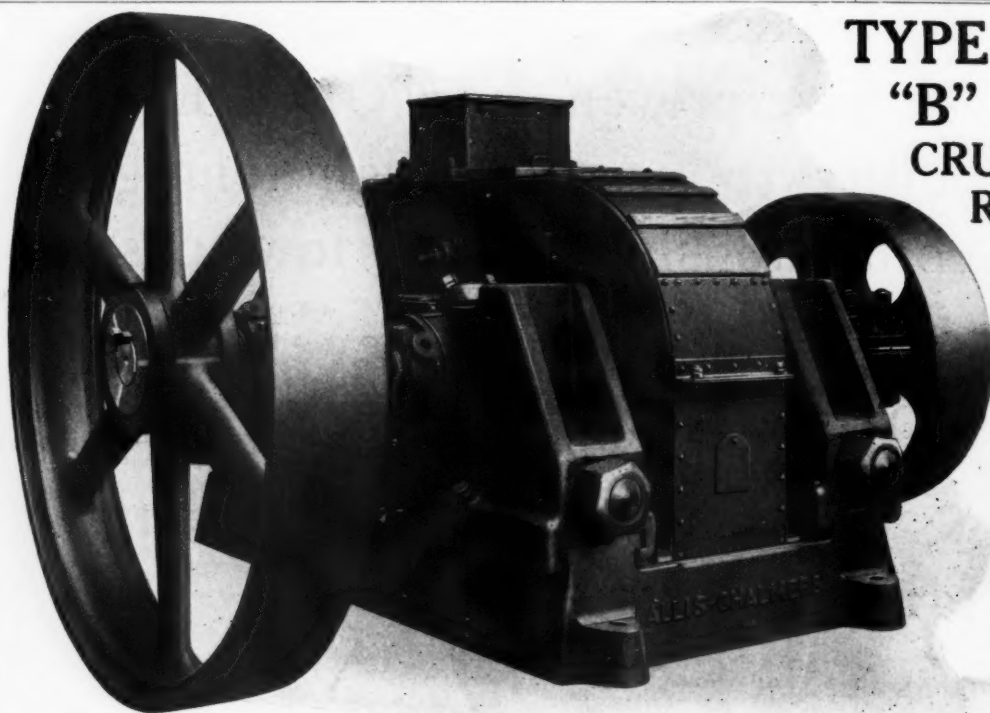
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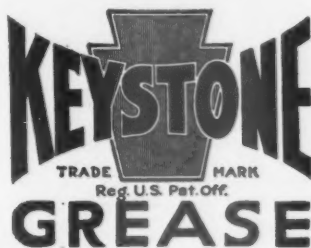
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C.H. Nowlin, Jr.
President, Killarney
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*"the effort of the
standard*

KILLARNEY SMOKELESS COAL CO.

PRODUCERS OF THE FAMOUS LOW VOLATILE



LYNCHBURG, VA.

January 22, 1927

Secretary National Standardization
American Mining Congress
Washington, D. C.

Dear Sir:

We acknowledge receipt of a copy of the American Standard Cover-
ing Safety Rules for installing and using Electrical Equipment
in coal mines for the inclusion in our copy of the hand-book of
Standard Approved American Coal Mining Methods—Practical Equip-
ment, for which we thank you.

We do agree with you that the efforts of the committee in develop-
ing such a splendid standard has been fully justified and will be
a valuable addition to the hand-book.

Very truly yours,

KILLARNEY SMOKELESS COAL COMPANY
C. H. Nowlin, Jr.

President.



Upper views show the tipple, baseball grounds, and typical houses for miners, Killarney Smokeless Coal Co., Killarney, W. Va.
Panorama shows the tram road with the tipple to the left in the distance. The Beckley Seam is located near the top of these mountains.

the committee in developing such a splendid
rd has been fully justified and it will be a
valuable addition to the handbook"

THIS is a real tribute. It is one of many spontaneous and enthusiastic expressions from those most concerned with the operation and safety of coal mines—expressions that show how intensely practical this pithy book is found to be.

The value of this Handbook of Standard Coal Mining Practice can hardly be over-estimated. It has been cooperatively produced by leading operators, engineers, manufacturers of equipment and mining and engineering organizations under the sponsorship of the American Mining Congress; it is a book that authoritatively systematizes and simplifies coal mining. The demand for it is world-wide.

Every subject in the Handbook is packed with suggestions that help you combine safety and efficiency with low cost in meeting conditions in your mine.

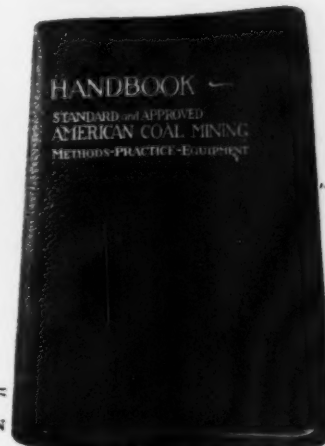
The mines of the Killarney Smokeless Coal Company are located near Beckley, in the Winding Gulf Smokeless Coal Fields of W. Va. on the C. & O. and the Virginian Railways. They are drift mines and the seams of coal worked are the Beckley Seam of New River Low Volatile Coal and the Pocahontas No. 3 Seam of Pocahontas Low Volatile Coal. Capacity of the mines is 1,200 tons per day of Lump, Egg, Stove, Pen, Slack, and Run of Mine—prepared over inclined shaker screens, picking tables and loading booms.

The mines are electrically equipped throughout. Mining machines used are shortwall. Coal is hauled by trolley pole and storage battery motors.



THE HANDBOOK is pocket size, loose-leaf, and is kept up-to-date as recommendations are approved. Its price is \$5. This includes a subscription to The Mining Congress Journal. For further information, address The American Mining Congress, 841 Munsey Bldg., Washington, D. C.

IMPORTANT SUBJECTS TREATED
in the Handbook of Standard and Approved American Coal Mining Practice include: basic rules safeguarding electricity in mines; electric tippie equipment; underground stations (all phases of automatic control of mine equipment); trolley and storage battery type locomotives; mine tracks, signals, and switches, including track gauge, turnouts, frogs and switches; mine cars; mine fans; airways and shafts and booster fans; wire rope, ladders, and miscellaneous coal handling equipment; pumps for development work, permanent pumping stations, natural drainage, and effect of mine water on equipment; loading machines, belt, chain and shaking conveyors, installing and operating cutting and loading equipment; general mine timbering, preservation of timbers, and use of concrete and steel.



**STANDARDIZATION
DIVISION,**

The American Mining Congress,
841 Munsey Building, Washington, D. C.

I am enclosing.....for.....copies of the
Handbook of Standard and Approved American Coal Mining
Methods, Practice Equipment—each order to include a sub-
scription to The Mining Congress Journal.

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City..... State.....

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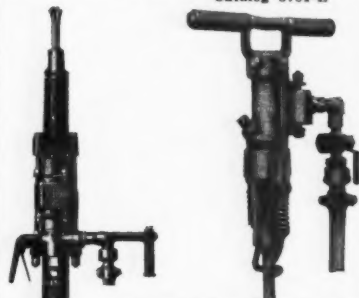


AMERICAN MINING CONGRESS

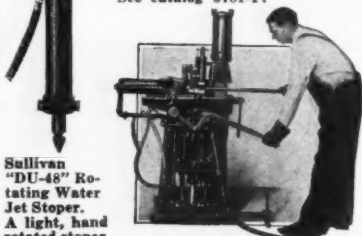
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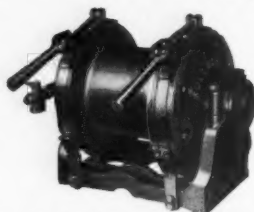


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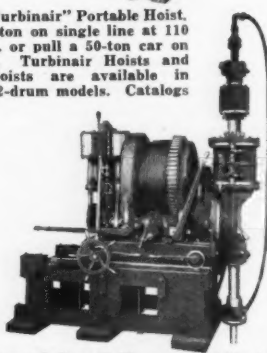


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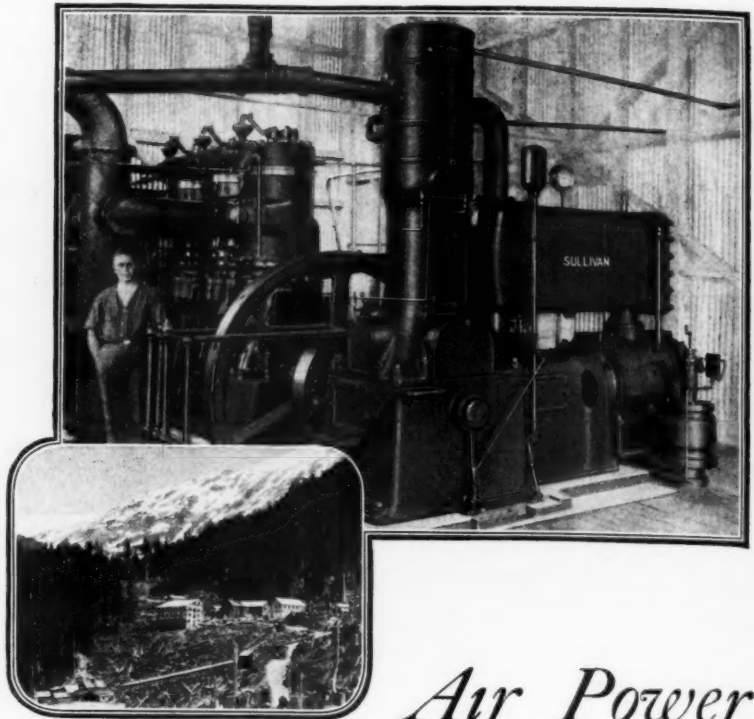
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Air Power At a Wilderness Mine

In the British Columbia Mountains, close to the Alaska line, the B. C. Silver Mines, Ltd., is developing a great mining enterprise.

To supply air power in this out of the way region, the Company selected a

Sullivan Angle Compound Air Compressor

direct coupled to a Canadian Fairbanks-Morse Diesel engine.

What the Company thinks of it is contained in their letter, printed herewith.

Angle Compound Compressors lend themselves ex-
cellently to Diesel engine drive by reason of:

1. Their angle design, which permits connection direct to the engine shaft by a single coupling;
2. The exact balance of their reciprocating masses and forces, which gives an even load and smooth running;
3. Their compactness, calling for small foundation and floor space.

For isolated mining camps, the Diesel Angle Compound Compressor plant, as a whole, shows unusual fuel economy, low over all installation cost as compared with either electric or steam drive, adaptability to any location, with high re-sale value, either separately or complete, low standby and attendance cost, and ability to pick up a load quickly.

The oil engine may be uncoupled from the compressor readily and used for operating a generator, pumps, or other equipment for a portion of the time.

Angle compressor sizes fit in nicely with Diesel engine sizes. Capacities 400 to 1800 cu. ft. Ask for Bulletin 3788-A.

Vancouver, B. C.,
July 23, 1926

The Sullivan Machinery Company,
633 Howe Street, Vancouver:

I take pleasure in advising you that the WJ-3 Angle Compound Air Compressor of 1051 cu. ft. capacity which you recently supplied, is running very satisfactory.

It is direct connected to a 3-cylinder Canadian Fairbanks-Morse 180-h.p. type Diesel engine, and the complete installation, of which I enclose a photograph, is the most satisfactory oil-driven air compressing plant that I have installed.

Yours faithfully,

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This experience is duplicated in industrial and power plants in almost every part of the country. Specific instances are constantly called to our attention. Hence a distinct trend towards wrought iron is observed in all places where corrosion is a factor, and where pipe materials are chosen with due regard to the heavy cost of pipe failures.

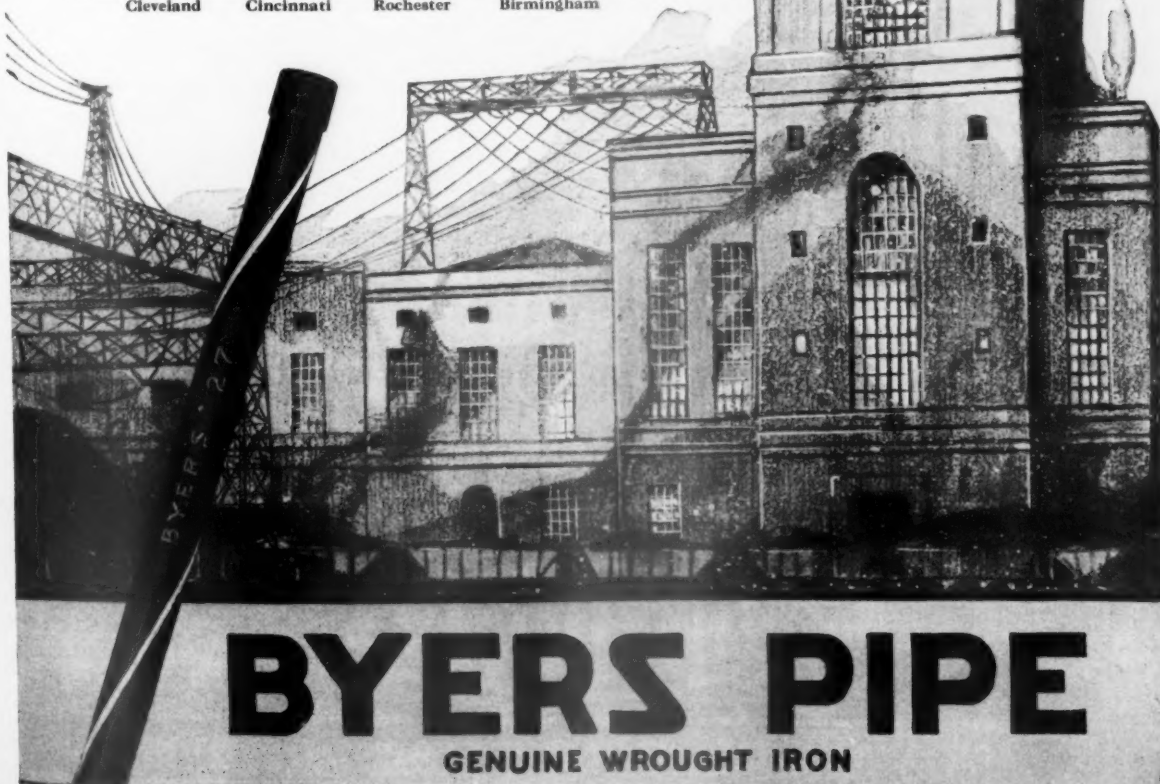
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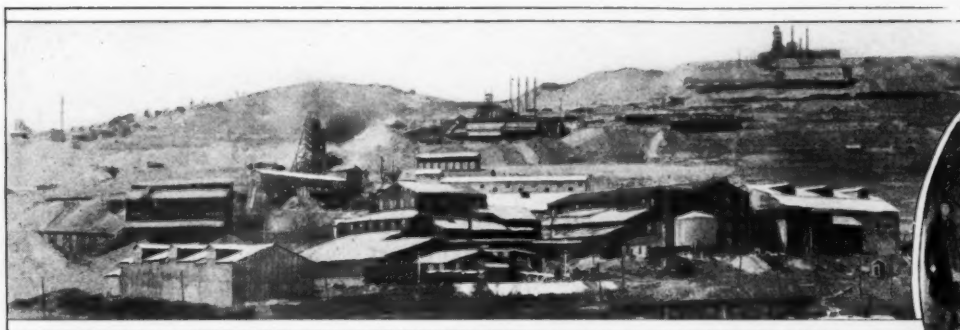
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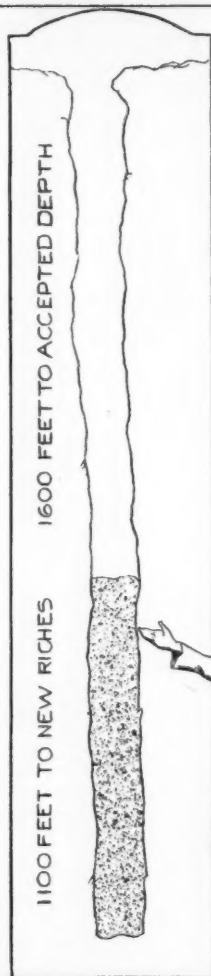
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at Victor, Colorado



An ore face in this mine, the sides of the vein indicated by the two lights.



Eleven Hundred-Foot Drive Locates Gold and Silver Veins of Portland Mine---Courage, Knowledge and duPont Explosives Responsible for this Result

SIXTEEN hundred-foot levels in the Cripple Creek gold field were considered to be the point at which ore veins ceased to yield a profitable tonnage.

But the mining officials and engineers of the Portland Mine had the courage to continue prospecting because of their knowledge of mining operations. They persisted driving their shaft deeper and deeper despite the high costs of labor and equipment. At 2,700 feet—over a thousand feet below the usual level of profitable mining—the knife-blade vein spread into ore veins 10 to 20 feet wide. The ore assayed 120 ounces of gold and 65 ounces of silver per ton—a remarkable reward to those whose courage and knowledge urged the driving through 1,100 feet of rock to discover larger and richer veins of precious ore. This pioneer effort convinced others that Cripple Creek mining operations were not restricted to 1,600 foot levels.

The original mining site of the Portland Gold Mining Company occupied about one-sixth of an acre. Today over 260 acres with 84 miles of underground workings show the development since 1891, when Winfield Scott Stratton located his famous Independence Mine—a neighbor to the Portland Mine.

In all of their mining operations, the Portland Mines have used du Pont explosives and blasting accessories. Gelatin dynamites of 30, 40 and 60 percent strength are producing the tonnage required, ensuring satisfactory working conditions and proving to be especially adapted to the ore miner's requirements.

The Portland Mine is an example where courage and knowledge combined with an efficient, specific du Pont explosive will achieve success. There's a du Pont explosive to meet your requirements. Why not investigate?

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Explosives Department

WILMINGTON, DELAWARE



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THE AMERICAN MINING CONGRESS

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VOLUME 13

APRIL, 1927

NUMBER 4

MINING STANDARD- IZATION

IN THIS AGE of mass production standardization is not only possible but essential. Great movements have been organized within the past ten years to bring about "standard" methods of production and "standard" equipment to increase production. The trend toward standards has been largely guided by the trade associations representing various phases of industry, and the results that have been obtained are truly remarkable.

Just what do we mean by a standard. Something that has proved itself superior in both performance and resistance. Standardization is definite, not approximate. In order to create a definite standard, drawings and specifications are essential. Complete standardization means that the consumer may add whole units to his equipment, as well as secure repair parts, with the certainty that the equipment ordered will be identical with the equipment specified. A leading manufacturer recently defined standardization as "interchangeability, which means duplication to the smallest detail."

The National Standardization Division of The American Mining Congress, to the furtherance of whose work this issue of the JOURNAL is dedicated, has for a period of seven years concerned itself chiefly with standardizing mine equipment. It has made many recommendations concerning both mining methods and practice which have been extremely helpful, but its great effort has been devoted to giving the mining industry standard machinery. In these seven years the personnel of the division has grown from a small group to a great organization composed of approximately four hundred and fifty operators, manufacturers, consulting engineers, and Government experts. It now has twenty-nine sections and subsections each studying diligently some phase of mineral production problems.

It has already given to the mining industry definite standards on Underground Power Equipment (Safety Rules for Installing and Using Electrical Equipment Underground), Mine Tracks and Signals, Wire Rope, Drainage, Mechanical Loading Underground for Metal Mines, Fire-Fighting Equipment, and Underground Transportation for Metal Mines. It will shortly release to the industry recommended standards on Mine Car Construction and Design, Ladders and Stairs, Mine Car Wheels, Ventilation, Drilling Machines and Drill Steel, and Methods for Mine Sampling.

These represent the result of seven years' effort by this group of men, and we submit that they have developed a truly amazing list of helpful standards, which,

when applied to mineral production, will reduce costs and create greater efficiency throughout the industry.

But these definite standards are only a part of their activities. Under the auspices of the Mining and Loading Section, Coal Mining Branch, an investigation is being conducted that has taken on industry-wide importance. G. B. Southward, well-known consulting engineer, in cooperation with members of this section, is carrying on a complete investigation into the possibilities of the use of mechanical loaders in coal production. He will visit every coal property in the United States that is employing any form of mechanical loading, and the result of his investigation will be released some time during 1927 to the entire mining industry.

An important investigation has just been started by the Mine Drainage Section, Coal Mining Branch, into the study of acid resisting metals; the Timbering Section has conducted an intensive investigation in the various methods of wood preserving, and the results obtained; this section is also studying the problem of reforestation.

A National Mine Accounting Code is being developed, as well as special studies being pursued in connection with Mining and Smelting problems, and Excavating Equipment, which is of great importance to metal producers.

A standard is developed only as the result of tedious, patient investigation and experimentation, and while it will be several years before the investigations above outlined will take the form of standards, the industry profits through the yearly publication of the findings of the committees.

Even after this long, tedious process of arriving at a standard, it is in no sense permanent. The division is a continuing organization, realizing that what may be good practice today may be obsolete ten years hence. Each year all standards are brought up to date in accordance with developments in the mining industry.

Simplification, duplication, interchangeability, superiority—these are the synonyms of standardization. The mining industry is awakening to the possibilities of this great work being carried on for it by a group of men whose only hope of reward is that mining itself may prosper. Any one of these standards, or investigations, developed and conducted by an individual company would cost it thousands of dollars. The service of the division is obtained by a nominal fee—the cost of publication of the recommendations.

Mine operators will find it decidedly to their advantage to demand "American Mining Congress Standards" in their equipment. They are simple, practical and economical. Their adoption will simplify production problems for the operator and for the manufacturer.

THE ACTION of the Utah Legislature in defeating a proposal to increase the taxes applicable to the mines of that state was a sensible and wise course. With state and local taxes in the East mounting each year, until the tax burden upon industrial enterprises is excessive, and discouraging to investors, eastern capital is certain to flow into Utah and other western states where principles of economy in the public expenditures and equality in taxation prevail. But capital is reluctant to go where discrimination in taxation is practiced and where excessive burdens are imposed upon minority classes that are unable to resist increased and inequitable taxation successfully.

Sound and equitable tax laws encourage the promotion and development of business and industrial enterprises. This is especially true of the mining industry. The development of mining in Utah has brought untold wealth to that state, and substantial increases in its population as well as prosperity to its farmers. There is room for still greater development. The natural resource industries of Utah are still in their infancy; and wise taxation will enable Utah to keep pace with, and perhaps exceed, the growth of her sister western states. Her iron ore resources give promise of future development, the value and extent of which can not now be estimated.

When the new tax measure was proposed, the mining interests were given a full hearing. They were able to make a strong case against the bill. The facts they presented could not be controverted. The arguments they made were sound. The legislature as a whole was fair. It is reported that even the proponents of the bill were convinced that the measure would be a mistake and were willing for the bill to be withdrawn. It is fortunate for the state of Utah that her taxpayers are well organized so that farmers, merchants, stock growers, manufacturers and miners are found working together in harmony for the interests of each other as well as the best interests of the state.

ONE OF THE TOPICS for discussion at the Cincinnati convention concerns "When and How to Unseal Mine Fires." At the meeting in 1926 "How to Seal Mine Fires" was discussed, and the session was one of the most interesting of the convention.

UNSEALING MINE FIRES

The Program Committee, in arranging the 1927 convention, has reversed the subject, and has secured the cooperation of J. J. Forbes, United States Bureau of Mines; Professor Steidle, of Carnegie Tech, and John T. Ryan, of Mine Safety Appliances Company, in presenting the major paper on this question. These gentlemen are developing a most interesting paper, dividing it into three major sections: "Organization Procedure and Factors that Govern Time of Unsealing," "Approved Devices Used in Unsealing Fire Areas," and "A Review of Practice in Sealing Fires." Mr. Frank Dunbar, of the Hillman Coal & Coke Company, will discuss this paper from the viewpoint of the operator, and R. M. Lambie, State Department of Mines of West Virginia, will discuss it from the viewpoint of the mine inspector.

Such a comprehensive handling of the subject should be of great value to the industry. While it is of vast importance to know how to seal fires, it is of equal importance to know how and when to unseal them.

THE LAND OF THE SOUTH, so rich potentially in undeveloped natural resources, is everywhere showing evidences of an industrial awakening of far-reaching importance and of large proportions. There, prosperity has been the exception rather than the rule; and much of the time has been almost a mirage or "will-o'-the-wisp" to the southern people. Plantations have suffered decay, their owners encumbered with financial, economic, and other disadvantages that were disheartening and cruelly burdensome.

But a new era has dawned for the southern states. A friendly invasion by capital and enterprising industrial genius has opened up possibilities for the development of minerals and other natural resources that inspire the South with hope. So that it is with a new faith, to paraphrase Governor Bibb Graves, of Alabama, in welcoming delegates to the Southern Industrial Conference of the Southern Division, that the people of the South have turned their faces toward the sun, and from now on will keep them so turned that the shadows may always remain behind.

The development of the natural resources of the South gives assurance of better conditions for the farmers. The creation of local markets for products of agriculture by the development and expansion of new mineral and manufacturing enterprises will make diversified farming an absolute necessity. This will prove an important, if not controlling, factor in the betterment of economic conditions and in the solution of the South's agricultural problem.

There is, however, one possible flaw in the picture of industrial activity and progress that one sees when visualizing southern conditions and prospects. That flaw is the migration of intelligent, experienced native sons, who otherwise would manage the farms and would perpetuate the control of southern agriculture by the pure colonial stock that still dominates. The young men are leaving the farms to make steel rails, motor cars, and concrete highways; to run trains, power houses, and manufacturing plants; to enter the trades, professions, and industries; all of which seem to him to have better futures and more remuneration.

There is danger, therefore, that the wheat, corn, and cotton fields, the truck farms and gardens will be found a few years hence in the hands of foreign or naturalized citizens to be exploited by them while the South grows industrially and her native-born sons follow other pursuits.

The discovery of methods for the extraction and utilization of low-grade iron ore and other natural deposits, and the successful development and establishment of mining enterprises that are thus assured, will result in profits to farms and plantations that have been operated without profit or at a loss. It therefore behooves the farmers and plantation owners to cooperate with the developers and operators of mines to see that the growth of mining enterprises of southern states is not hindered or stifled by discriminatory and oppressive taxation through the adoption of a severance tax or any other special tax on mines and other natural resources.

The southern people still hold to the ideals of constitutional government that characterized their forefathers. Radicalism has not touched them. The traditions of the fathers have been their lighthouses, the farms and plantations their anchorage. If they remain and serve the new industries that are springing up, they will reap the bountiful rewards that are sure to follow from participation in the development of a modern industrial empire.

IN RETROSPECT AND PROSPECT

THE SOUTH is becoming more and more dependent upon tariff protection for the development of its resources. Well-known southern industrial leaders realize that the life and growth of the new industries that are coming into being throughout the southern states depend upon the maintenance of adequate safeguards against the

A BENEFICENT TARIFF WALL

competition of the products of cheap foreign labor in our home markets. Without such safeguards, home industries could not flourish, swollen pay rolls could not be sustained, and our high standards of living could not be continued. He who would jeopardize these by permitting the exploitation of our home markets by foreign importers, exemplifies the proverbial intelligence of the ostrich.

But the beneficial effects of equalizing costs of production abroad with our costs at home by the adjustment of tariffs is being felt south, north, west and east, and the beneficiaries, the citizens of this country, will be reluctant to try any different plan or to abandon the principles of the plan now in operation.

That the protective policy of our Government is largely responsible for the dawning of a new industrial era in the South is apparent from the manner in which this is being accomplished. Practically every new industry that has come into being in the South and in which rapid development or growth is noted or is in prospect, needs protection against foreign encroachments; and that protection is afforded. So that the states are assured of additional taxation revenues from the new wealth being created; labor is certain of enjoying steady employment at higher wages and better working and living conditions than exist in any other country on the face of the globe; and investors have reasonable assurance of a fair return on their capital investments. The importance of these factors to the future of the South is immeasurable.

Here is what Richard H. Edmonds, noted editor of the *Manufacturers Record*, whose efforts to promote the welfare of the South are legion, thinks about it. In a letter to the Birmingham conference, referring to the development of southern mineral resources, he says in part:

"Call the roll of all the minerals on which the world's industry is founded and but few of them will be missing from the South. * * *

"So extensive are the South's mineral resources, and so varied and so well located geographically for development, that scarcely any limit can be set to the development which may be brought about through these vast stores of nature's gifts to this heaven-favored land. * * *

"In the fullest utilization of these natural resources of the South a protective tariff high enough to safeguard our country against the pauper labor of the Orient and the near-pauper labor of Europe is essential. * * *

"In maintaining a protective tariff high enough to safeguard our agricultural and industrial interests, we are rendering a distinct service to mankind. * * *

Unlike the western, northern and eastern states, the South only recently has been touched by the magic wand of industrial development, such as is fanning the glowing embers of ambition and initiative and the blazing fires of enthusiasm and progress that light the paths to future industrial supremacy in the Birmingham dis-

trict. But very soon all sections will be conscious of the new spirit that is invading the South, and taking root in the minds of the people—stimulating and spurring their latent genius and inherited resourcefulness into healthy activity that eventually will yield enormous returns.

THE TENTATIVE PLAN OF PROCEDURE proposed by the Division of Investigation, Joint Committee on Internal Revenue Taxation, includes references to depletion of mines and depreciation. It contemplates the collection of statistics on these subjects, and states that the purpose is "to show the relief afforded various industries" by the provisions of law covering these deductions.

CAPITAL DEDUCTIONS FROM INCOME

No objection can be offered against the fullest investigation and consideration of these subjects by the joint committee; but the use of the term "relief" indicates that the committee's investigators have an erroneous conception of what depletion and depreciation are and why they must be taken into account in any fair determination of the net income of mines. This conception must be corrected.

The provisions of the income tax law allowing deductions for depletion and depreciation in the determination of net income are not "relief" provisions. It is recognized as a basic principle that deduction must be made from income for the capital or physical property used up in the production of such income. In other words, it is recognized in the case of mines that a portion of every dollar received from the sale of mineral represents capital which should not be subject to an income tax, but should be returned to the owner tax free. The exclusion or deduction from gross income of so much as is simply a return of capital is not "relief," and is no different in principle from the allowance for cost of goods sold in the case of a merchant.

The statement made in the tentative report that "allowances for depreciation are probably the largest deductions from gross income," may be true; but if statistics show this, it doubtless is only because most of the costs and expenses of commercial enterprises are, through the arrangement of the income tax forms, thrown into cost of goods sold and so deducted before showing gross income instead of being included among the items which appear on the form as deductions from gross income.

Congress recognized early in the development of the income tax system that the amount representing a return or replacement of exhausted capital is not true "profit," and therefore not income that should be subject to the income tax any more than the "cost of goods sold" by a merchant. The several revenue acts do not specifically mention the "cost of goods sold" as a deduction from the selling price, but the courts early decided that this was an essential deduction to be made in order to determine taxable income, and since it was not otherwise allowed, it must be intended as an allowance in computing the gross income with which the statutory computations begin.

The use of the term "relief" in connection with depletion and depreciation, therefore, is wholly out of place; and this conception should be dissipated before any conclusions are reached and based upon it. The income tax law purports to tax income which constitutes profits; and it in no sense gives "relief" by the mere allowance as deductions of items which are essential to the determination of true net income.

IN THIS AGE of industrial supremacy no principle of business can survive which makes for inefficiency. This

THE COAL WAGE DISPUTE LESSON

is one of the chief lessons now being learned in the labor world of coal production. The union fields are idle because those fields can not meet the competition of more efficient production elsewhere.

Production costs are made up by the charges of capital, management, and labor. If the cost of capital in comparison with production is too much, if the charges of management are excessive, if the charges of labor are too great, then the production is handicapped in its effort to find a market.

This over-capital charge may be in the mine or in the agencies of distribution. The excessive cost of management may be in excessive salaries, in poor managers, or in conditions which prevent the management from actual control. This too great cost of labor may be caused by too high wages, inefficiency of the workmen, or by association rules which restrict effort or which prevent absolute direction of the operation by its supposed management.

It is conceded that the amount of capital invested in coal mining is far greater than is necessary to meet the requirement of present consumption demands. This is a necessary condition because of the fact that all the coal for this and all future generations is now available for production. This handicap exists alike in the union and the non-union fields.

The costs of management are not considered to be excessive except in the case of incompetency. This condition exists alike in the union and the non-union fields.

The difference, then, between the semi-prosperous non-union fields and the desperation and stagnation of the union fields must be looked for in the union itself, which stands for, supports and demands the conditions which make for a too great cost of the labor as compared with the tonnage produced.

We may dismiss the inefficiency of the individual miner as a cause without argument. Whether wages are too high or too low must be measured against the cost per ton of output, which in turn is so largely affected by hampering union rules and interferences with position, execution, direction and control.

For instance, the operators of the States of Indiana and Illinois lived up to the Jacksonville wage agreement faithfully and as fully as possible. Yet in Indiana, as stated by the veteran leader, Phil Penna, at the recent Miami wage scale conference, more than one hundred unauthorized strikes had taken place during the last three years. This was denounced by Mr. Penna as a tyranny to which the operators of Indiana would not longer submit. These strikes were in defiance of executive orders. In each case the mine manager's control was defied. Inefficiency of production was the certain result, which, if no other cause existed, was sufficient to so increase costs as to keep production from any market which could pay the increased cost. If our reasoning is correct, the United Mine Workers of America, as now constituted, can not survive because it makes for industrial inefficiency.

THE MINING CONGRESS JOURNAL believes in organized labor when, and only when, its organization has for one of its purposes the prevention of injustice to itself and to all other interests with which it is associated. It must be as ready to fight against an injustice to its employer as to resist unfair treatment by its employer. It must recognize itself as one part of a machine which must earn enough to pay a profit to its employer as well as a proper

wage for itself. It must stand for an honest day's service for a fair day's wage and it must recognize that, in the end, wages must bear a proper relation to price levels in the market which finally absorbs the coal which it produces.

The United Mine Workers of America can not survive, and ought not to survive, unless its purposes shall make for a betterment of the conditions of that industry of which it is an integral part.

THE AMERICAN MINING CONGRESS—The National Exposition of Coal Mine Equipment—The Annual Convention of Practical Coal Operating Men—and May, have become as definite a part of the scheme of things as the seasons of the year.

AN IMPORTANT ANNUAL EVENT

Nineteen hundred and twenty-seven is no exception. Sixty coal-operating men, in cooperation with the various coal operators' associations, are developing a program for the May meeting that will bring out every man who can possibly leave his post. Among the important operating problems to be discussed are: Cleaning coal by the pneumatic or dry-cleaning process; by the launder system; by the sand flotation process; by the table washing method; how to clean small size coals, large size, and off grade and crop line coals. Three sessions will be devoted to discussing the problems of loading coal mechanically, and all of the discussion for these sessions will be confined to actual mining operations. The remaining sessions will discuss Safety and Cutting and Blasting.

So far as the program as a whole is concerned, it is of outstanding merit, and the men participating in the discussion will present information that will be of real assistance to the industry in solving its problems.

Every coal producer should make his plans now to be at Cincinnati during the week of May 16. It is an event that must not be missed.

NEVER HAS THERE BEEN a greater group of exhibits assembled than those that will make up the National Exposition of Coal Mine Equipment, to be held under the auspices of the Manufacturers Division, The American Mining Congress, and in conjunction with the Annual Convention of Practical Coal Operating Men, at Cincinnati, Ohio, May 16-20. More than one hundred manufacturers of mine equipment will participate, and their displays will go far in supplementing the convention discussions.

THE NATIONAL EXPOSITION

The practice of combining the exposition and convention, and housing them under one roof has been a real innovation, and an extremely wise move, because it enables the operating man with a minimum expenditure of time to discuss his production problems and see at first hand the equipment especially designed to solve them.

The manufacturer is afforded an opportunity to sit in the discussion, and learn with definiteness the problems that confront the coal producer. He goes home better equipped to meet the needs of the industry. Likewise the operator goes home filled with new ideas and with specific knowledge of the equipment that is best adapted to meet his situation.

The convention and exposition affords the greatest opportunity for a real "get-together" of any event of the year. Be sure to be among those present.

IT HAS BEEN SAID RECENTLY that the number of laws theoretically operative in the United States, including city, county, state and national, approximates ten million. If this be actually true, the committee formed by the American Law Institute to codify, simplify, and classify the laws of this country has before it a huge task.

THE LAW PLAGUE

According to an article in *The American Mercury*, during 1925 some 13,000 new laws appeared on the statute books of the forty-eight states, and fifteen typical American cities added approximately five thousand laws and ordinances in one year.

During the last two years the United States Congress was asked to consider approximately 25,000 legislative bills. It actually enacted 1,422 of them into law, although this number would have been greatly augmented but for the legislative jam in the closing days of the session. Committees of the House of Representatives made reports on 2,319 bills, and Senate committees made 1,717 reports. Various Government departments, independent bureaus, and commissions made 1,055 reports to Congress, while the President sent one hundred messages!!

Truly such a record, in an already much over-lawed country, is alarming. Not alone from the standpoint of the people who must obey them, but from the standpoint of the men who put them upon the statute books. No man, no matter how well-informed, can possibly vote intelligently upon 25,000 proposed laws in a two-year period. And when we consider that the 48 state legislatures, in this same two-year period, have considered thousands of additional "laws," it certainly seems that the people for whom all this legislative zeal is being shown should rise and proclaim a new era: "A lot of unnecessary laws must be repealed," and permanently discard their slogan of the past, "There ought to be a law passed."

The people themselves send representatives to Congress, to the state legislatures, and select city and county officials. If they are tired of all this law making, it seems wise that they should say so. It is true that frequently congressmen sponsor legislative proposals purely for the purpose of getting into the spotlight, and not because any majority want the legislation. But the larger portion of the laws proposed and enacted are directly due to the desires and demands of some loud-voiced minority that wants to control the progress of the race.

Beyond those laws and rules of conduct that are based upon the simple, God-given commands laid down in the Ten Commandments, the man-made "thou shalt" and "thou shalt not," are arousing the ire of the people. It is a rule of legal jurisprudence that "ignorance of the law is no excuse" for its violation. But under our system the presumption that everyone knows the law has become a farcical platitude.

The man who went to bed at his hotel and remained there for twenty-four hours in order to make sure of winning a bet that he could live for that many hours without violating any law committed a misdemeanor and lost his bet because the sheet under which he slept was short of the 58 inches in length required by the laws of the state which regulated the operation of hotels.

"A LITTLE LEARNING," it is said, "is a dangerous thing." An educator is supposed to be better educated than those whom he teaches. The 116 Princeton University professors, led by President Hibben of that once great educational institution, are doing all in their power to demonstrate that if a little learning is dangerous—that much learning unfits them as leaders of public thought. These men have recently joined in a manifesto demanding a revision of the Allied war debts. Since these settlements were made the nations of Europe have steadily moved forward toward greater stability and prosperity, with the sole exception of France, which has not yet acknowledged her honest obligation. No country can prosper by repudiation. France refuses to join the movement toward disarmament. France wants to keep the money she owes the United States to finance her military establishment.

THE ALLIED WAR DEBTS

The United States as a nation is working toward world peace as effectively as world politics will permit. World peace is an impossibility except upon a basis of national integrity. World trade is practically impossible except upon a basis of mutual credit. Credit is the basis of modern business—a country without credit can not hope to pay its past obligations nor be able to create future obligations. Without credit, without mutual confidence, there can be neither peace nor prosperity.

The Princeton professors have demonstrated their own incompetency as leaders of public thought. "Much learning hath made thee mad! Horatio."

THE TREND toward mechanization in the mining industry is clearly evident in the program for the Fourth Annual Convention of Practical Operating Men, scheduled for Cincinnati in May.

THE TREND TOWARD MECHANIZATION

Investigation and experiment are showing that any installation of mechanical loading means more thorough coal preparation, and almost inevitably a coal-cleaning plant.

It is especially interesting to know how the program for the Cincinnati meeting was arrived at. Sixty operators, representing the various coal-producing districts, together with the secretaries of the coal associations, were asked to furnish The American Mining Congress with a list of subjects they felt could be discussed profitably this year. At least 90 percent of the replies asked for a discussion of (a) mechanical loading, (b) coal preparation. The result is that the Program Committee has arranged for three sessions at which coal preparation problems will be discussed, and an additional three sessions at which to discuss mechanical loading. The committee has attempted to develop the discussion with representatives from those companies where certain types of equipment have been installed for a sufficient length of time to enable them to accurately gauge its performance, and to definitely outline the results that have been obtained. Every coal operator who wants to know more about mechanical loading, and who has the problem of cleaning his coal, should arrange to attend this meeting. The results of the discussion are bound to be far-reaching, especially when combined with the industry-wide investigation being conducted by The American Mining Congress into the possibilities of mechanical production.

PROGRESS IN MINING STANDARDIZATION

From A Modest Beginning, The Present Work On This Subject For The Mining Industry Has Grown To A Nation-Wide Committee Composed of 450 Members—A Review Of What Has Been Accomplished

By COL. WARREN R. ROBERTS *

WITHIN the past three months the mining industry has been presented with three major standards, and within the next 30 days at least three additional reports will have been released.

The American Engineering Standards Committee, through which the National Standardization Division of the American Mining Congress releases its recommendations for mining standards, has recently approved the recommendations of the division for national codes on "Safety Rules for Installing Electric Equipment in Coal Mines," "Wire Rope for Use in Mines," and "Mine Tracks and Signals." The Reviewing Committee of the A. E. S. C. has already passed the recommendations for "Coal Mine Drainage Standards," and the release of this report awaits the formalities of the Standards Committee.

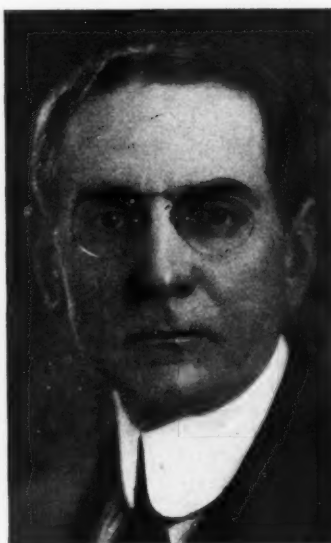
Before proceeding to discuss this subject it will be of interest to note the growth and development of the organization through which this work was accomplished.

When the officials of the American Mining Congress were planning for their annual convention, to be held in St. Louis during September, 1919, they realized the importance to the mining industry of some agency undertaking the work of improving the methods and practices in mining, and of improving and standardizing as far as practical the equipment and machinery used in mining. The Mining Congress therefore sent invitations to such mine operating officials, consulting mining engineers, and representatives of manufacturers of mining equipment and machinery as they thought would be interested in this work, to attend a conference to be held in connection with their annual convention. This effort resulted in the first standardization conference on behalf of the mining industry. At this conference, after a thorough discussion of the subject, plans were formulated for carrying forward this work through a Standardization Division composed of two branches—one representing the metal mining industry and the other the coal mining.

These two branches were divided into sections, each of which would represent a certain classification of mining, and

the work of these sections was to be carried on through committees composed of mine operating officials, representatives of the manufacturers, government representatives, and consulting engineers.

This original plan (prepared by the men present at the First Standardization



Col. Warren R. Roberts

Conference) has been found so successful that it has been adhered to ever since, only expanding the organization as the work developed.

By referring to the First Standardization Bulletin, recording the work of the Standardization Division for the year 1920, I find there were eight committees in the Coal Mining Branch with a total membership of 77, and eight committees in the Metal Mining Branch with a membership of 70.

The last published report of our Standardization Division in the March issue of THE MINING CONGRESS JOURNAL shows that the Coal Mining Branch is now composed of 29 committees and subcommittees with a membership of 273, while the Metal Mining Branch has 21 committees and subcommittees with a membership of 165. This gives a total for the Standardization Division of 50 committees and subcommittees, with a membership of 438, not including several advisory committees. These figures indicate the growth of the Standardization

Division during a period of about seven years.

I will now review very briefly the work accomplished by certain committees and subcommittees during the past year. In this connection please note that other committees and subcommittees, not now mentioned, have not been actively pursuing their work during this year, as they were awaiting action on their reports which had been submitted to the American Engineering Standards Committee for consideration and approval as American or tentative American standards.

The Committee on Underground Transportation, through its subcommittee on Mine Tracks and Signals, Mr. Charles H. Partington, Cincinnati Frog & Switch Co., chairman, has entirely revised their report previously submitted to the American Engineering Standards Committee for approval. Such revisions were made in compliance with suggestions from the Sectional Committee of the A. E. S. C. to have this report meet their approval. This revised report from this subcommittee was completed some time since and submitted to the Mining Standardization Correlating Committee representing the A. E. S. C. in the mining industry. This is a most complete and valuable set of standards on mine tracks, including standard specifications fully illustrated for frogs, switches, turnouts, etc. It is doubtless one of the most complete and valuable reports submitted by any of our subcommittees.

Our Committee on Mine Timbering has been entirely reorganized under Mr. R. E. Krape, of the Rochester & Pittsburgh Coal Co., Indiana, Pa., chairman; each of the subcommittees enlarged, and one new subcommittee formed, namely No. 6 on "Reforestation," with Mr. A. C. Silvius, Philadelphia & Reading Coal & Iron Co., as chairman.

Subcommittee No. 1, General Mine Timbering, Simplification of Grades and Names, Mr. D. F. Holtman, National Wood Utilization Committee, chairman, rendered a progress report indicating that a very considerable amount of time and thought has been given to the work since the subcommittee was reorganized under the present chairman.

This subcommittee, through their chairman, also made a very important recommendation to the Standardization Conference regarding the cooperation of the Committee on Mine Timbering with the National Committee on Wood Utilization of the Department of Commerce.

* Chairman, Roberts & Schaefer Co., Chicago, Ill. Chairman, National Standardization Division (Coal Mining Branch), The American Mining Congress.

This recommendation was heartily approved by the conference, and it is believed will result beneficially to the work both of our Mine Timbering Committee and the Mine Timbering Committee of the National Committee on Wood Utilization.

Subcommittee No. 2, on "Preservation of Mine Timbers," Mr. George M. Hunt, Forest Products Laboratory, chairman, has submitted a further progress report to this conference. (Mr. Hunt's report will be found in full in this issue). This subcommittee has done a great deal of valuable work in gathering information on the subject of preservation of mine timbers, indicating the economies accruing from preservation, describing and illustrating processes, and discussing the various preservatives which may be used for this purpose, etc.

Subcommittee No. 3, "Use of Concrete in Mine Construction, Mine Shafts," etc., Mr. Newell G. Alford, H. N. Eavenson and Associates, chairman, has submitted an additional progress report giving the results of their investigation of Concrete Shaft Linings. This committee will continue to expand their investigations during the coming year covering the other uses of concrete in mine construction.

Subcommittee No. 4, on the Use of Structural Steel for Mine Timbering, Mr. J. D. Snyder, Consolidation Coal Co., chairman, has been reorganized recently and only fairly begun their investigations on the advantages of the use of structural steel in mining operations.

Subcommittee No. 5, Salvage of Mine Timbers, Mr. George T. Stevens, chairman, I believe has not made much progress during the year. There is no doubt that there is a great deal of valuable work which this committee could do for the mining industry.

As mentioned above, Subcommittee No. 6, on Reforestation, has only recently been organized, and we hope during the coming year they will be able to gather much valuable information on this subject and submit their recommendations to the next Standardization Conference.

Our Committee on Mining and Loading Equipment has received a great deal of our attention during this year, as we feel that this is one of the most important subjects before the industry. At the semiannual meeting of the American Mining Congress, held in Cincinnati last May, we held two sessions of this committee which were very well attended, both by representatives from the mine operating officials and manufacturers of mining and loading equipment. At this conference this committee gave careful consideration to the difficult problems confronting the industry in connection with the adoption of mechanical loading, with the object of deciding on how this committee could best serve the industry in solving these problems, and thus fa-



L. E. Young

cilitate the adoption of mechanical loading of coal.

As a result of these meetings the American Mining Congress secured for the committee the services of Mr. Glenn B. Southward, well-known consulting engineer, who will make a special investigation for the committee, concerning the actual conditions surrounding the application of mechanical loading in coal mining.

Mr. Southward has been conducting this investigation since January 1, 1927. He has now visited, in cooperation with members of the Mining and Loading Section, Dr. L. E. Young, chairman, and the writer as chairman of the Coal Section of the division, some 40 coal mining properties where mechanical loading is being applied to coal production.

The results so far obtained substantiate the opinion of the committee that

MECHANIZATION INVESTIGATION

The Mining and Loading Section, Coal Mining Branch, National Standardization Division, The American Mining Congress is making rapid progress in its investigation on the application of mechanical loaders to coal production. Mr. G. B. Southward, Consulting Engineer to the American Mining Congress, is conducting the investigation which is being directed by Dr. L. E. Young, Pittsburgh Coal Company, Chairman of the Mining and Loading Section. Mr. Southward has visited more than fifty coal operations where some form of mechanical loading is being used. His preliminary report will appear in the May issue. It is anticipated that this work of the Mechanical Loading Section will give great impetus to the mechanization trend in the industry.

such an investigation would be of major importance to the coal mining industry.

Mr. Southward's reports will first be submitted to the chairman of the Mining and Loading Committee, where they will receive full consideration; later they will be presented by the committee to the National Standardization Division, and finally will be passed upon by the Board of Directors of the American Mining Congress.

These reports will appear first, beginning with the May, 1927, issue, in THE MINING CONGRESS JOURNAL, official publication of the American Mining Congress, and of the National Standardization Division.

THE MINING CONGRESS JOURNAL has carried various announcements concerning this activity, and anyone interested in obtaining more complete information may do so by addressing the Washington, D. C., office of the organization.

While Mr. Southward's work in its inception is with the Mining and Loading Committee, his service will be available to other committees, when he has completed the present investigation.

In fact, another committee of the division is now awaiting his release from this work, in order that he may conduct an investigation for it. This is the Committee on Mine Drainage, of the Coal Mining Branch. At a meeting of the Drainage Section, at Pittsburgh, Pa., March 9, a resolution was adopted authorizing reorganization of Subcommittee No. 5, "Mine Water and Its Action on Mine Equipment." The chairman of the Drainage Section, J. A. Malady, Hillman Coal & Coke Co., Pittsburgh, Pa., pointed out the difficulty his company is experiencing in obtaining acid-resisting metals. It was agreed that Subcommittee No. 5 should be reorganized and, in cooperation with Mr. Malady as temporary chairman and Mr. Southward as engineer investigator, an industry-wide investigation should be made of this important subject.

The report of the Coal Mining Branch on Mine Ventilation, which was submitted by the division to the American Engineering Standards Committee, has been returned to the American Mining Congress for further consideration. At a meeting of the Standardization Division held in Washington, this report was formally withdrawn from consideration by the A. E. S. C.

The Section on Outside Coal Handling Equipment has done excellent work during 1926. Their report on wire rope is now an established standard, and their recommendations on miscellaneous outside coal handling equipment, and ladders and stairs, will soon be ready for the industry.

The committees working upon the problem of Power Transmission and Power Equipment completed the first



A. B. Kiser



J. A. Malady



C. H. Trik

portion of their program, through the release to the industry of the National Standard Code on this subject.

I will now review briefly the methods the American Mining Congress have used in distributing the reports of the Standardization Division to the mining industry.

After the Second National Standardization Conference held in November, 1920, and when the first series of reports from the committees were submitted, these reports were very carefully edited and published in the First Standardization Bulletin of the A. M. C. These bulletins were distributed very widely to the industry gratuitously. The same policy was pursued in the distribution of the Second Standardization Bulletin. Meanwhile the Standardization Division had developed to such an extent, and the work of the committees had grown in volume, making the publication of these Standardization Bulletins very expensive. It was, therefore, decided to make a charge of \$1 for these bulletins, and they were sold in large numbers to the industry on this basis. This price not being sufficient to cover the expense incident to publication, distribution, etc., it was decided in distributing the Fourth and the Fifth Standardization Bulletins to increase the price to \$2. It was very gratifying to the American Mining Congress, and especially to the Standardization Division, that the sales of our bulletins increased very materially, even at the advance price, indicating the value placed by the industry on these bulletins. This success with the sale of the bulletins, which contained the full reports of the committees, with all discussions, containing therefore a great deal of extraneous matter, led the Congress to consider the advisability of preparing a handbook for the mining industry which would embody the substance of all the reports in all the Standardization Bulletins and therefore give the industry in

condensed form "Standard and Approved American Coal Mining Methods, Practice and Equipment."

This handbook was carefully prepared for the Congress by their consulting engineer, Dr. Henry Mace Payne, and advertised to the mining industry for sale.

The sale of the handbook exceeded the expectations of the Congress and again evidenced the value placed upon the standards prepared by our committees.

The handbook is prepared in loose-leaf form, carefully classified and indexed for convenience in use. The loose-leaf form was adopted as it is the purpose of the Mining Congress to replace the reports of any committees or subcommittees, or any part of these reports, as they are from time to time revised by the Standardization Division and approved by the American Mining Congress. It is gratifying to state that there will very shortly be extensive improvements and additions to the contents of the handbook, due to the good work of certain of our committees and subcommittees during the period since the handbook was issued.

For the past five years the American Mining Congress has released its standards to the industry through the American Engineering Standards Committee. This is, its reports were all submitted to that body for approval before being released to the mining industry.

The American Engineering Standards Committee is a highly deliberative body. It is composed of representatives of the leading engineering, technical, and trade associations. In the case of the mining industry, it created a Mining Standardization Correlating Committee, which is composed of representatives of the associations dealing directly with the mining industry. This body of men became a reviewing committee for the recommendations sponsored by the National Standardization Division of the American Mining Congress. However, the process

was exceedingly slow. The Standardization Division grew impatient at the delays, and at the meeting of the division held at the Mayflower Hotel, Washington, D. C., December 10, 1926, passed a resolution asking for the recall by the American Mining Congress of all reports before the American Engineering Standards Committee which did not give promise of early attention. The American Mining Congress, in convention, accepted their resolution and instructed its board to so withdraw the reports. A resolution was also adopted which calls for a complete reorganization of the division, but only along lines of personnel enlargement. It was agreed that much of the difficulty might be overcome if each of the organizations interested in mining standardization should appoint an official representative, to sit in with the committee from the inception to the completion of its recommendations.

This reorganization has not yet been undertaken, but will be begun shortly.

In the meantime Secretary of Commerce Hoover has sponsored a National Standardization Survey, in order to learn just where the standardization movement is headed. This survey includes mining, as well as lumber and many other key industries. A meeting of the committee, which includes well-known industrial leaders as well as representatives of the leading trade associations of the country, was held in New York on March 11, and another will be held within the next 30 days, when they will determine the scope and character of the work they will undertake.

All of this shows the amazing growth of the standardization movement, not alone in the mining field but in every branch of industry. An important phase of standardization work is the development of National Safety Codes. This is of major importance to the mining industry, and is something that the Standardization Division is cooperating with in a whole-hearted manner. In fact, every committee of the division is giving safety, as applied to its particular problem, special attention.

The division has grown with great rapidity. The mining industry has accepted its recommendations wholeheartedly. And while we have accomplished a great deal, we feel that the work has but begun, that there lies before us a broad path of usefulness.

I bespeak for the division the same splendid support that has been given in the past. Great things have been accomplished through cooperation, and this is a strictly cooperative effort.

CAN INDUSTRY MAKE ITS OWN LAW

How Far And How Rapidly Industrial Self-Government Can Go In Relieving Legislature And Court, And In Relieving Industry Of Burdensome Restrictions Depends Upon Vision And Initiative Of Industrial Leadership

By P. G. AGNEW *

THE rules of the game are constantly shifting. Industry, business, simply will not stand still. The growing pains are clogging legislature, court and commission with a mass of problems they can not handle.

By far the greater number of the problems we are now attempting to solve by legal machinery are industrial.

Can they be handled by industrial means?

Much more than is generally realized has already been accomplished in developing non-legislative methods of solving such questions. The growth of commercial, industrial and professional associations during the last 25 years has furnished the background and the machinery necessary to solve such problems through cooperative channels.

Many examples of cooperative undertakings of the kind might be cited, differing widely in nature and in importance, and in various stages of development. Most of these are based essentially, though with many variations, upon the simple process of the various parties at interest facing each other and the common problem across the council table, developing the facts, and reaching common consent and agreement.

There may be mentioned as examples:

The numerous codes of ethics which have been adopted by trade and professional associations.

The United States Pharmacopoeia, the national list of drugs with specifications for purity, which is prepared through the systematic cooperation of the medical and pharmaceutical fraternities, but which does not have the force of law. (The pharmacopoeias of other countries do have the force of law, but they do not appear to be any more successful on this account.)

The use of "impartial chairmen" in adjusting and developing relations between employers and employees.

The "Simplification-in-Industry" movement inaugurated by Secretary Hoover, in which, under the lead of the manufacturers, the various branches of industry concerned with a particular line of products agree upon the elimination of unnecessary sizes and varieties.

One of the most important and ambitious of such movements is in the domain of law itself, the program of the American Law Institute. It is undertaking a work which it is intended, "shall not only analyze the existing condition of

the law and set forth the legal problems involved, but shall also set forth with the care and precision of a well-drawn statute those principles which will not only tend to clarify and simplify the law but better adapt it to the needs of life."

But I believe this movement toward industrial self-government has gone further and has reached a higher degree of



P. G. Agnew

development in industrial standardization than in any other direction. Accordingly, it is instructive to compare the methods that have been developed in standardization work with the methods of the common-law and the statutory-law processes of arriving at national consensuses.

The common-law process is well illustrated by the familiar example of the rates at an old English inn. A traveler, dissatisfied with the charges demanded by his innkeeper, might have recourse to a court. Through long series of decisions of many cases in many courts, each decision serving as a precedent to be cited in other cases, there had early emerged one of the principles of the common law, namely, that the charges in such cases must be reasonable—and reasonable rates had come to be defined as the rates customary in inns of that class. As a part of this evolutionary process of law-making, a regular machinery had been developed for determining what was custom-

ary, namely, the testimony of innkeepers and of travelers as to what rates actually had been charged in specific cases.

As an example of the standardization method of getting a national consensus, let us choose a specialized but relatively simple industrial problem, the protection of workmen in the use of grinding wheels. What are reasonable provisions for safety?

The work of formulating a safety code on the subject was carried out by a joint committee made up of representatives of all interested groups; the manufacturers through their national trade association; state commissions having regulatory authority over safety matters in the industries, or charged with the administration of accident compensation, through their national association; employing groups which are users of grinding wheels, through their trade association; casualty insurance companies through their two national organizations; the workmen whom the code is designed to protect, the representation being arranged through the United States Department of Labor; national engineering societies; technical bureaus of the Federal Government; and independent specialists.

In all, 17 national organizations are represented on the joint committee, which has 30 members. After two years of painstaking work, unanimous agreement upon a complete code was reached. This was not accomplished, however, without encountering some serious difficulties and differences of opinion. Through patient and conscientious effort a solution of all these problems was found.

The code covers the general safety requirements to be met in the construction, care and use of grinding wheels. It is recognized as the authoritative guide to industry and is being legally adopted by the various state commissions.

This is one of some 50 industrial safety codes that are being formulated by the same general process and with the same care, through systematic cooperation of all interested groups. After substantial unanimity is reached and registered by action of the joint committee responsible for any particular code, the code is formally certified as the "American Standard Safety Code," for grinding wheels, or for punch presses, as the case may be, by the central organization which serves as a clearing house or means of systematic cooperation in this national industrial standardization movement—the American Engineering Standards Committee.

* Secretary, American Engineering Standards Committee.

The reaching of a national consensus on such an industrial problem, through the statutory-law process, is an extremely difficult matter, the more so that legislation on nearly all such subjects comes within the jurisdiction of the legislatures of the 48 states. Since few, if any, members of a legislature have adequate knowledge of such a problem, the initiative and the general direction of legislative movements of the kind are in the hands of interested people outside the legislature; in short, in the hands of the lobby.

In state after state the question is fought out before legislative committees by those groups sufficiently interested and alert to participate. In the great majority of cases the real decisions are made by legislative committees whose members, themselves lacking adequate knowledge of the subject, necessarily have to base their decisions upon the presentations of the case by the parties at interest.

In the legislative mill most specialized problems get lost in the game of partisan politics over popular issues. In nearly all cases, the overwhelming majority of people are necessarily ignorant both of the existence of the problems and of the attempted legislative solution. To a large extent the same is true of the legislators themselves. At the end of the average session of a legislature, it would be but a small handful of the members who could recognize half of the subjects of the bills which have been enacted into law.

With such conditions in each state, anything approaching national uniformity becomes extremely difficult, often impossible. The experience of the National Commission for Uniform Legislation, which is an official body, has shown that even in the case of legislation which meets with general favor, at least 10 years are required to attain uniformity in the more important commercial states, and 20 years before general adoption.

The legislative method, in short, is not a suitable one for the solution of innumerable specialized and more or less technical problems that arise in the development of industry and business. It does not reflect upon either the ability or the probity of legislators as such, any more than the statement that hammer, chisel and saw are not suitable tools for the making of watches reflects upon either the ability or probity of carpenters as a class.

Legislation on technical matters frequently hampers progress. The state law of Pennsylvania lays down in great detail just how blasting in coal mines shall be conducted. Research has developed an improved technique which not only reduces the life hazard in the mining of coal but makes possible very definite economies in production. Yet the intro-

duction of the safer and more economical technique is prohibited by the law.

A safety code dealing with machine shop practice has been taken as an example of the general plan followed in modern industrial standardization work. It is typical of the 200 projects which are going forward on a national scale. The procedure applies equally to specifications for use as a basis of purchase, for example, specifications for paint, cement, and metals; dimensional standardization to secure interchangeability of supplies and the interworking of apparatus; methods of testing apparatus and materials, particularly as a basis of acceptance in commercial transactions; nomenclature, including definitions of technical terms used in specifications and contracts; and grades and grading rules.

For more than half a century the American manufacturer has been standardizing within his own plant, and this has been an essential factor in the development of mass production, which is the chief American contribution to the development of industry.

Company standardization gave rise to collective standardization within more or less homogeneous groups. Such group standardization carried on by technical and trade associations has been an important development of the last quarter century.

Just as company standardization led to group standardization, so the latter has inevitably led to national standardization among industries as a whole, technical and trade associations here playing the same role that the individual company plays in group standardization.

When substantial unanimity is reached and registered by action of the joint committee in charge of any particular project, the standard is formally certified as an "American standard" by the national clearing house—American Engineering Standards Committee.

Similar national standardization movements have been developed in all of the principal industrial countries. There are now 20 such national organizations, each of which serves as a clearing house and provides the machinery for systematic cooperation of all interested groups within its own country. More than 250 national organizations are officially co-operating in the work of the American Engineering Standards Committee. These are primarily technical and trade associations, and departments and bureaus of the Federal Government. In six years of work 90 national standards have been formally agreed upon and more than a hundred others are well under way. Usually from 10 to 15 national organizations are represented on the technical committee handling each project, but sometimes there are as many as 35.

An interesting and crucial test of the genuineness of the consensus which the standardization method yields lies in the legal aspects of the results.

Time-honored phrases in contracts, such as "good workmanship throughout," "best commercial grades," which actually mean nothing and often lead to the law courts, are giving place to clear, definite specifications as a basis of purchase. Such specifications, together with the methods of making acceptance tests, are made so definite that any competent engineer or testing laboratory can determine whether material supplied on contracts based upon them complies with the standard. These standards are becoming of steadily increasing importance; for example, more than 95 percent of the cement produced in this country complies with a single specification.

One might think that it would be sufficient to specify that the diameter of a steel rod should be 1 inch. This, however, is not the case. If it be a fitting part, it is necessary to specify how close to the ideal diameter of 1 inch the part must be made. If only the diameter be given, the purchaser may attempt to reject the material on the ground that it is not sufficiently accurate since no rod can be made precisely 1 inch in diameter on account of unavoidable limitations in workmanship. On the other hand, the seller may attempt to deliver wholly inaccurate material, claiming it to be within commercial limits. The solution of the problem consists, not in a lawsuit, but in specifying precisely within how many thousandths of an inch the material must be to the ideal dimension. The variation thus allowed is technically known as the "tolerance." Systematic methods of classifying different grades of fits, together with the precise tolerance allowed in each case, have been developed as a guide to the mechanical industries.

Of equal importance is agreement upon technical terms used in specifications and contracts. It is to be recalled that a large part of the civil cases with which courts deal hinge upon the exact meaning of words and phrases. In fact, a large, perhaps even the greater part, of standardization consists intrinsically in agreement upon definitions.

After careful study, counsel of long experience with important industrial and trade association matters are of the opinion that in the matter of safety codes the results of the method will have an important legal bearing upon local regulations, ordinances, and rulings. Suppose, for example, that through the regular procedure which has been outlined a unanimous or practically unanimous agreement has been reached on the degree of protection which should be required against the hazards in the use of some particular device. Suppose a local authority imposes a much more drastic

requirement. A court in considering the reasonableness of the more drastic requirements will almost of necessity consider the existence and status of the national code and the method followed in its formulation so important that it would be difficult to produce evidence that would outweigh it. Similarly, in a case in which very much less protection had been provided.

The legislative method and the standardization method are both designed to keep pace with the development of industry, which has far outstripped the possibilities of the common-law process.

The standardization method does not cast the work into a rigid mold, which is often the case with legal methods. For example, a year after the safety code for grinding wheels was issued, there were two important accidents incident to developments that had not been foreseen at the time the code was formulated. Within a few months necessary investigation had been made and provision to take care of the new condition was well under way.

In a particular case it may take longer to get a decision by the voluntary cooperative method than through legislation or official administrative act. On the other hand, as has been shown, a real consensus is much more readily obtained. Normally, this means that a reasonably satisfactory solution, and not a mere compromise, has been reached on fundamentals, though compromises are often necessary on less important details.

It may often be necessary to "settle" questions by majority vote of legislative bodies, or by the arbitrary decision of an executive officer, even though important dissenting minorities have to be overridden. It not infrequently happens, however, that questions "settled" in this way do not stay settled, because they have not been solved but only decided.

The standardization method has all the directness and vitality of elementary local self-government.

We do not leave to Congress, or to the vote of 110,000,000 people, the decision whether a bridge shall be built in the city of Oshkosh. We leave it to the people of Oshkosh, who will walk over it and ride over it, and who will have to pay for it. Why should not the very limited groups directly interested in each of the innumerable industrial problems with which they are faced themselves solve these problems through cooperative effort?

It is significant that each joint technical committee, upon which all interested groups are represented, and in which decisions are reached, is essentially a miniature legislature organized upon a subject bases instead of upon a geographical basis. It is the same principle upon which trade associations are organized, and trade associations play a far more

important role in the development of industrial policies than do chambers of commerce, which are organized along geographical lines.

It may be asked—it has been asked—whether the standardization movement is a step toward the "industrial parliament," which enthusiastic prophets proclaim is about to supplant, or at least to supplement, our existing legislative machinery.

Such speculations are interesting, but the fact remains that the movement must continue to develop along conservative lines, since each problem has to be solved by men responsible for the continuity of the industrial processes involved.

In other words, the movement is evolutionary and not revolutionary. Furthermore, its success so far has depended upon the simple direct relations which have been compared to those in local self-government. Could these be maintained in a complex structure, or would there be the same sort of pyramiding which seems to be inherent in all large political units? Probably the answer would depend upon whether such a comprehensive structure could in practice be based upon two simple fundamentals: First, that the integrity of such a plan must rest upon sincere and continuous effort to get solutions, rather than mere decisions; second, that there must be a real consensus of all groups concerned with each problem in regard to its solution rather than the enforcement of a decision by mere voting power.

Unfortunately, the majority of us do not yet appreciate this, so used are we to the continual drive for power through ability to command a majority vote. It is remarkable that in this scientific age so large a part of political government yet consists of the attempt to go by the royal road of issuing decrees—for decrees they are, whether issued by executive, by court, by commission, by legislature, or by popular vote—instead of by the painstaking one of seeking the facts and securing a real consensus in a solution based on the facts.

The cooperative method is at present not without serious limitations. Many important groups are not organized so that they can act effectively in work on problems to which the method is applicable. There is the frequent shortsighted jockeying for immediate commercial advantage. There are the endless jealousies and bickerings within and between organizations and groups. Most men do not understand the meaning of representation and its responsibilities. There are many important problems to which one would expect the method would apply, in which those most concerned are not yet ready to take their place at the council table for a candid examination of all the facts. The method can not com-

pel cooperation; it can only induce it.

Nevertheless, experience in diverse fields has amply shown that the method combines many of the advantages of the common law and of the statutory law methods, and that it is flexible and responsive to changes in industrial conditions, while it avoids many of the limitations and abuses that have grown up about the legislative process.

How far and how rapidly industrial self-government can go in relieving legislature and court of the impossible load which they are now facing, and in relieving industry of the resulting burdensome and hampering restrictions, must depend upon the vision and the initiative of our industrial leadership.

The enormous amount of gold and silver which finds its way each year into India is disclosed in a report on the Bombay bullion market issued by the Department of Commerce. During the past five years, the report shows, India has absorbed annually 6,000,000 ounces of gold and 90,000,000 ounces of silver, representing, respectively, 40 and 30 percent of the world's annual output of these metals.

Estimates place India's present holdings of gold at 125,000,000 ounces, valued at \$2,500,000,000, while its silver holdings approximate 4,216,000,000 ounces, which at current values represent \$2,750,000,000.

Of India's imports of treasure, gold at present represents about 70 percent and silver 30 percent. About one-fourth of the demand for gold is in the form of sovereigns and other gold coins. The coins are for purely ornamental uses, however, as there is no circulation of gold as currency and no minting of gold. The remainder of the demand is for gold bullion for hoarding and for conversion into ornaments. In its reserves the Government of India keeps gold coin and gold bullion, the balance at present amounting to more than 5,250,000 ounces. Because of the great accumulation of silver currency in India, there is no demand for silver for coinage and likewise no demand for the metal as reserves. Accordingly all the absorption is in response to the demand for bullion for social and ornamental uses.

India's supply of gold is obtained chiefly from imports, as the domestic production is negligible. Most of the sovereigns bought are obtained in London, while practically all of the bar gold is now purchased in Durban, South Africa. The bulk of the silver also is from London. For a time silver was obtained largely in New York, but the financial advantages commanded by London have resulted in a reversion to the prewar condition, when all of the North American silver sold in India was marketed through the British capital.

DEVELOPMENTS IN MINE EXCAVATING EQUIPMENT DURING 1926

Investigation Planned Of Conditions To Which Each Machine Is Best Adapted—Other Possibilities Of Standardization

By HARRY C. GOODRICH*

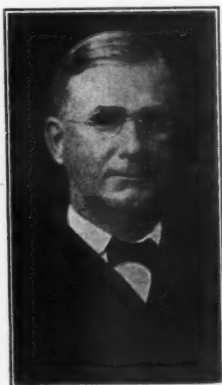
THE major equipment coming under the purview of the Committee on Mine Excavating Equipment, exclusive of dredges, and with which it is more particularly concerned, is in large units, and therefore no one property would have use for any considerable number. As these units are costly to construct, and therefore not frequently replaced, there would seem to be little likelihood of any great degree of success in standardization except as brought about through influencing future construction. The types in use follow the design of the manufacturers, who have been guided to some extent by the wants of the different users. This has resulted in a considerable variety, but when it is remembered that each mine has its own peculiar problems in development and exploitation, due to such items as shape of the ore body, topography of the site, character of the ore with respect to hardness and friability, etc., it is apparent that there can be no restriction to the number of types. Different conditions naturally require different machines and different methods. For this reason it is believed that little further progress can be made by collecting and attempting to correlate data as to types of machines, but rather that the investigation should go deeper into this question and develop our knowledge as to the particular conditions of mining under which each peculiar kind and size of machine is deemed to be best adapted; in other words, to study standardization in terms of performance.

The standardization of replaceable parts is a field which this committee expects to develop during the coming year. Another matter under consideration is the factors in design which contribute toward higher efficiency, including such

auxiliary equipment as contributes to such efficiency.

During the past few years there has been much progress in developing machines of larger capacity and also in the utilization of electricity and oil for power in lieu of steam. These developments are continuing, and considering the condition of flux which characterizes the state of the art at the present time, it is questionable whether too much standardization, other than that above set forth, is desirable. Generally speaking, standardization is practicable only when no further improvement in design seems possible.

In order to bring the questions in which this committee has interest more effectively to the attention of the mining public, and particularly to those interested in excavating equipment, and to provide data for a complete statement of the kind of equipment used and the particular conditions which control in the selection of the different types and sizes of machines, it is the hope of the committee that during the coming year it may secure from different operators, for publication in THE MINING CONGRESS JOURNAL, articles similar to that published in the December, 1926, issue, pertaining to the operations at Chuquicamata, Chile, and dealing fully and comprehensively with these matters. By correlating such data it is the thought of the committee that other lines along which standardization should take place and the means for accomplishing it may be suggested.



H. C. Goodrich

MINE TIMBERS STUDIES

The Metal and Coal Sections, National Standardization Division, The American Mining Congress, devoted to an investigation into Mine Timber Problems, will cooperate with the National Wood Utilization Committee, sponsored by Secretary of Commerce, Hoover, and will appoint a committee to represent the Mining Industry in the National investigation into better methods of wood utilization.

These Sections have a large program outlined for 1927-1928 in their studies in Preservation of Mine Timbers, Reforestation, and the Use of Concrete in Mine Timbering.

EFFICIENT BLASTING METHODS IN METAL MINES

THAT the cost of mining in hard-ore stopes in metal mines can be decreased appreciably by the use of proper blasting methods and care in the selection of explosives has been demonstrated by the Bureau of Mines in the course of a series of experiments conducted in certain Arizona copper mines.

In many western mines the ore is very hard, and present methods of drilling and blasting often break it down in large boulders which must be plugged and blasted or broken by hand. Breaking up these large fragments is a hazard to the miners, as flying particles of ore from hammering or sledging may injure the eyes or cause cuts and bruises. With large boulders there is also the hazard of drilling into missed charges.

Besides the risk of injury and the added cost in breaking them, these large fragments in stopes increase the cost of shoveling the ore and often prevent adoption of a more economical stoping method. Were it not for the boulders, many deposits of hard ore could be mined by a method that would permit efficient handling of the broken material by mechanical devices, with a consequent saving in labor.

The Bureau of Mines, in cooperation with the mining companies of the Southwest, is making investigations to ascertain the safety and most economical explosives to be used in metal mines and to determine the best methods of blasting under various conditions. Different phases of the main problems are being taken up at mines where the solution of a problem is of particular advantage to the mine as well as of value to the industry as a whole.

At the suggestion of officials of two large Arizona copper mines, engineers of the Bureau of Mines undertook an investigation to ascertain the most efficient grade of explosive to use, and to develop a method of blasting by which the ore in the hard stopes could be broken from the back in smaller fragments. In this work the methods of mining and drilling were considered fixed and the investigators sought a solution of the boulder problem by the use of improved blasting practices and a better selection of explosives.

The Bureau of Mines investigators point out that, if more consideration is given to the primary blasting in many hard-ore stopes, fewer large fragments will be formed.

The results of this investigation are given in Technical Paper 383, "Blasting to Lessen Boulders in Hard-Ore Stopes," by E. D. Gardner and S. P. Howell, copies of which may be obtained from the Bureau of Mines, Department of Commerce, Washington, D. C.

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MECHANICAL LOADING UNDERGROUND IN 1926

No Radical Change Has Occurred In Mechanical Loading In Metal Mines In 1926—Large Increase In Employment Of Scraper Loaders—Remarkable Increase In Efficiency And Speed—A General Outline Of Progress

By LUCIEN EATON*

THERE have been no radical changes in mechanical loading underground in metal mines in 1926 either in machine design or in practice. The period has rather been one of steady growth. There has been a large increase in the employment of scrapers, especially in the iron mines of Lake Superior; and some remarkable increases in efficiency and speed through the use of loading machinery have been accomplished, notably the breaking of the world's drifting record at the New Cascade Tunnel by A. Guthrie & Co.

In railroad tunnel work the Conweigh and Myers-Whaley loaders have been preeminent in the advance headings, with small, railroad type steam-shovels, driven by compressed air, for loading in the larger section of the bore. The tendency toward larger equipment is marked.

In mine drifting the smaller shovels, the Armstrong, Hoar and Butler, have continued to do good work, but the curtailment of the development program of metal mining as a whole has limited their field of application. A larger size of Mayne loader has been built, which has done good work in drifting.

The application of scrapers using double-drum hoists has shown rapid growth, especially for drifting and stopping on sublevels. Here the tendency toward stronger power plants and heavier scrapers has continued, with the electric drive leading. Both the Denver Rock Drill Mfg. Co. and the Sullivan Machinery Co. are making very successful electric hoists up to 10 h. p., keeping the sizes within the limits generally accepted for the air-hoists. With these hoists the dimensions of the scrapers have remained almost unchanged, but the weight has increased in many cases from 200 pounds to 400 pounds or more, the increase in weight making it unnecessary for the workman to ride the scraper.

A larger scraper-hoist has also been put on the market by the Sullivan Machinery Co. in response to a demand for heavier equipment. This is a double-drum hoist with planetary transmission,

very similar to their smaller hoist, and is designed to be driven by an electric motor of 15 to 25 h. p. The Lake Shore Engine Works makes a slightly larger

In 1923 The Metal Mining Section of The National Standardization Division, The American Mining Congress, presented to the industry its recommendations on Standard Practice and Equipment in Mechanical Loading Underground. Mr. Eaton has been Chairman of this section since its formation, and the recommendations of his Committee have been received with interest by metal mine operators, and are being adopted extensively. The recommendations for standards on this subject are still before the American Engineering Standards Committee, which is just now enlarging its Mining Standardization Correlating Committee to enable it to pass upon Metal Mine Standards. While the Committee is comparatively inactive, awaiting the decision of the A. E. S. C. upon the work it has already accomplished, it has each year kept its recommendations thoroughly abreast with developments in the industry.

hoist of similar general design also for electric drive, which is being successfully used in the Lake Superior iron mines. This hoist was designed for use in the



Lucien Eaton

hard-ore mines, but has recently found application in soft ore with a large box scraper where the distance hauled exceeded 150 ft.

The use of slides with scrapers for loading cars, where chutes are not available, has become common practice, and has proved very advantageous especially in places where the temperature is too high for hard physical labor.

Practice has changed somewhat in regard to ropes, and it is generally conceded that the highest quality is the most economical in the long run. The use of an independent wire-rope center in place of hemp, in order to prevent crushing on the drum, has many advocates, but its superiority is not thoroughly established.

At the present time no thoroughly satisfactory block for the tail-rope or for pulling around corners is on the market, and most of the large users make their own blocks. There is room for improvement here, and the demand will undoubtedly be met in a short time.

Although the economy of using scrapers or other mechanical loaders is in some mines considered insufficient to warrant their installation, this is usually in places particularly well adapted to hand loading. In narrow, inclined veins, where the dip is too flat for the broken ore to run by gravity, and in top-slicing on sublevels the economies effected and the increase in production obtained by the use of scrapers have become thoroughly recognized.

Imports of iron ore into the United States during 1926 were greater than those over any similar period since 1920, with the exception of 1923, according to the Iron and Steel Division, Department of Commerce. In all, 2,555,441 gross tons of iron ore were received in the various ports of entry of the United States during 1926, as against 2,190,697 tons in 1925, 2,047,055 tons in 1924, and 2,768,000 tons in 1923.

Of the 1926 receipts a little more than one-half was supplied from mines in Chile, about one-fifth came from Cuba, and approximately one-eighth originated in Algeria and Tunisia. Large tonnages were also received from Newfoundland and Labrador, from Spain, and from Sweden.

*Cleveland Cliffs Iron Co., Chairman, Committee on Mechanical Loading Underground, National Standardization Division, Metal Mining Branch.

UNDERGROUND TRANSPORTATION IN COAL MINES

A Review Of What Has Been Accomplished By The Underground Transportation Section, In Its Efforts To Develop A Series Of Standards To Be Applied To The Transportation Of Coal Underground

By FRED NORMAN*

THE Committee on Underground Transportation began active work as a committee at the American Mining Congress Convention held in St. Louis, Mo., in the fall of 1919, and has been kept more or less busy up to the present.

The field of activity of the committee covers the transportation of coal from working face to tippie, and in order to handle the matter efficiently subcommittees were organized to divide the work, and in some cases the subcommittees were further divided into sectional committees, each handling a specific part of the work assigned to the subcommittee.

As it now stands, the main Committee on Underground Transportation is divided into three subcommittees: No. 1, Coal Mine Car Design and Construction; No. 2, Mine Tracks and Signals; No. 3, Mine Locomotives. No. 1 subcommittee is divided into three sectional committees: "Mine Car Design," "Mine Car Wheels," and "Handbrakes."

The scope of the work is to develop material for recommendations of practices and construction relative to transportation of coal underground, with a view of having such recommendations accepted as standards.

To this end, the committee has been and is gathering all available information of present practices, constructions and improvements from both operators and manufacturers, and is endeavoring to organize or crystallize such information into practical and economical concentrations that will serve the common good, to eliminate multiplication of designs, to simplify manufacture and reduce waste.

It is not an easy matter to effect desirable results. Often it becomes extremely difficult to harmonize differences of opinion, established customs, new ideas, etc., with occasional conflicting viewpoints of operators and manufacturers. Many hard snags are encountered, and many hot sessions of the subcommittees have resulted.

*Chief Engineer, Allegheny River Mining Co., Kittanning, Pa. Chairman, Committee on Underground Transportation, Standardization Division, American Mining Congress.

Subcommittee No. 2 on Mine Tracks and Signals has had an especially rocky existence. Plans have been formulated with drawings and specifications only to be rejected at the next meeting, redrawn, resubmitted, again rejected, and the whole matter rehashed for the third time before actual results were obtained.

Subcommittee No. 1, Coal Mine Car Design, has through its sectional committee, "Car Wheels," completed its recommendations, while "Mine Car Construction" and "Handbrakes" are still active. Subcommittee No. 2, Mine Tracks and Signals, has completed "Tracks," but has not yet taken up "Signals."

The Underground Transportation Section of The Coal Mining Branch, National Standardization Division, The American Mining Congress, has for a period of more than eight years been studying the problems of the transportation of coal underground.

It has brought out definite recommendations concerning mine car wheels, mine locomotives and Mine tracks and signals. These recommendations have been passed by the Mining Standardization Correlating Committee, and are now before the American Engineering Standards Committee for formal approval as American Standards.

The Committee on Mine Car Design and Construction has recently submitted its recommendations to the Correlating Committee, where they are now up for vote and criticism.

The Committee on Mine Tracks and Signals has done a notable piece of work. Their recommendations have just been put in final form, and constitute a truly valuable work on this subject.

This Section of the Standardization Division has done excellent work. It has won the praise, cooperation and confidence of the mine operator, who in a great many instances is specifying "American Mining Congress Standards on Underground Transportation" in purchasing equipment.

Copies of the recommendations of this section are available to the industry. They may be obtained as a complete code, or recommendations covering the four major phases of the subject may be obtained separately. This code is also available to the industry through the Handbook of Standard and Approved Coal Mining Methods, Practice and Equipment, which is a compilation of all of the Standards developed by the Coal Mining Branch.

Subcommittee No. 3, Mine Locomotives, has completed its report. The committee has accordingly worked out in detail and submitted for action the following recommendations for standards:

Mine Cars: Wheel base, proportional dimensions, maximum heights, etc., with sizes of wheels, threads, flanges, axle diameters, etc., accompanied by numerous drawings and tabulations.

Mine Tracks: Gauge of track, weight of rail, turnouts, switches, frogs, etc., with drawings, tabulations, and specifications.

Mine Locomotives: Voltage, ratings, weights, drawbar pulls, locomotive and motor ratings.

The above represents a great amount of work by the subcommittees, a great deal more than the results obtained would indicate.

At the present there is no activity in any of the subcommittees, which are awaiting the outcome of work submitted.

The accomplishments are not all that was hoped for, but some real benefits to the coal industry may be derived from the earnest endeavors of the committee members.

Accidents in the coal-mining industry of the United States in February caused a loss of 162 lives among the employees, according to the Bureau of Mines. Of these deaths, 129 were in bituminous mines and the remaining 33 in the anthracite mines of Pennsylvania. The output of bituminous coal for the month was 52,904,000 tons, showing a fatality rate of 2.44 per million tons produced. The fatality for anthracite mines was 5.64, based on a production of 5,852,000 tons.

The combined fatality rate per million tons for January and February was 2.66 for bituminous mines as compared with 4.94 for the same period last year, and 6.04 for anthracite mines as compared with 5.32.

There were no major disasters during January and February, showing a marked improvement over the same period of 1926, in which there were six such disasters with a total loss of 170 lives.

SAFETY RULES FOR INSTALLING AND USING ELECTRICAL EQUIPMENT IN COAL MINES

Each State Has Its Own Laws And Regulations Regarding Mining Practice — Rules Recommended Covering Installation And Use Of Electrical Equipment Proposed As Guide To Safe Methods

By FRED L. STONE*

ON OCTOBER 8, 1926, the American Engineering Standards Committee put its stamp of approval on a document entitled "Safety Rules for Installing and Using Electrical Equipment in Coal Mines." This approval means that the American Engineering Standards Committee believes that the rules and suggestions contained in the document constitute the best and safest methods of doing the work under consideration and that the rules in question shall constitute an American standard.

Before the American Engineering Standards Committee approval is given, the subject of approval must pass a Mining Correlating Committee, who in turn appoint a sectional committee made up of representatives from all interested parties, this latter committee reporting to the Correlating Committee and the Correlating Committee in turn reporting their verdict to the main body. It is quite obvious that by the time the American Engineering Standards Committee approval is received, the subject of approval will have undergone what might be termed "triple distillation."

The rules in question were made up in response to what seemed to be a need on the part of the operator to know what was safe and good practice in the use of electricity about coal mines.

The conditions in coal mines differ from almost any other industry, in that in all coal mines a certain amount of inflammable gas is given off from the face. This gas, when mixed with the oxygen of the air, forms a very explosive mixture. The bituminous mines have the added hazard of explosive dust. Both of these mixtures can be set off by a spark.

Sparks around electrical machinery are quite common; consequently an opportunity is presented for the use of considerable judgment in the installation of electrical apparatus. The majority of direct current circuits in mines have a ground return. Mines are usually damp and even wet with water containing a varying amount of sulphurous and sulphuric acid. Consequently, personal contact with a live wire usually results in a very severe shock, which in many cases has proven fatal.

The work of compiling a set of rules

to be used as a guide for the use of electricity around coal mines was started some years ago by the Bureau of Mines

"Each State in the Union has its own rules and regulations regarding mining practices. This situation is very confusing, and in some instances places a handicap on some operators as compared with their neighbor just across the state line.

**** At some future date it is hoped that the situation will be set right, and that the states will look for some guide in drawing up intelligent laws regarding the use and installation of electrical equipment underground. It is natural to suppose that these states will at that time adopt the standards advocated by The American Mining Congress, and proclaimed national by the American Engineering Standards Committee."*

in collaboration with some operators and a few manufacturers' representatives. In 1916 the result of their labors was published by the bureau in Technical Paper 138. At the time of its publication, this was a very creditable addition to the general knowledge of the subject. As time went on, the need of more up-to-date information was felt. The American Mining Congress undertook to revise



Fred L. Stone

and enlarge the work already done. The Bureau of Mines was appointed joint sponsor with the American Mining Congress in getting in shape the data for presentation to the American Engineering Standards Committee. This work was completed and final approval received as previously stated.

It is hoped by the sponsors that the mine operators will see to it that such suggestions as are applicable to their particular case are put into use. Many progressive operators are already doing this. Numerous requests have been received by the American Mining Congress for additional copies of the standard to be distributed among the men actually doing the installing.

It is hoped that the state mine inspectors will use the rules as a guide when called upon to pass on electrical installations in mines. The standards should be very helpful to these men, whose training in many cases has not given them a very great familiarity with electrical matters.

Each state in the Union has its own rules and regulations regarding mining practices. In many instances they vary greatly as to what the operator may or may not do. State laws relative to electrical matters in mines are in most cases rather meager, but such laws as various states have made differ greatly among themselves. This situation, to say the least, is very confusing, and in some instances places a handicap on some operators as compared with their neighbors just across the state line.

At some future date it is hoped that this situation will be set right, to a large extent at least, and the states will look for some guide in the drawing up of intelligent laws regarding the use and installation of electric power underground. It is natural to suppose that the states will at that time adopt a part, at least, of what the American Mining Congress has advocated as standard practice, and what the American Engineering Standards Committee has made an American standard.

It is to be hoped that the rules themselves will be kept up to date and changed to suit modern and changing practice. It has been the constant endeavor of the committees representing the sponsors to keep the rules as reasonable as possible consistent with safety. No operator need fear that the adoption of the rules will run him into a large amount of expense from which the return is debatable.

* General Electric Co. Chairman, Committee on Power Equipment, Standardization Division, American Mining Congress.

SAFETY STANDARDS IN THE MINING INDUSTRY

Educating The Miner In Safety A Job Which Challenges Ingenuity And Ability—Splendid Progress Has Been Made In Mine Safety Work, But If Accidents Are Eliminated Safety Must Be Integral Part Of Operation Of Each Mine

MINING is undoubtedly one of the most hazardous industries in the United States. Mining operators, however, as a group have really made remarkable progress in accident prevention during the past 17 years. For instance, the United States Bureau of Mines reports that in coal mines from 1907 to 1924 the number of fatalities per 1,000 man-hours worked has declined 23.6 percent, while fatalities per million tons of coal mined declined 38.5 percent. This record compares very favorably with similar records of other industries.

Progressive operators, nevertheless, realize that still better accident records can and must be established and that further progress depends upon their ability to make improvements in teaching safety to their bosses and miners, and in devising better and safer mining methods.

Before making improvements it, of course, is necessary for the individual operator to study existing conditions and to determine in his own mind just what methods are now being used to the best advantage, not only in his own mine but also in the mines of his competitors as well. It is in this way that "standards" are developed, and, fortunately for the individual operator, he is saved a great deal of time and trouble because much of this standardization work is being done for him (but with his cooperation) by such organizations as the United States Bureau of Mines, the American Mining Congress, various state mining departments, the American Engineering Standards Committee, and the National Safety Council. All of these organizations and many others are rendering a specific service to the mining industry, and no operator can afford to ignore them.

STANDARDS FOR EQUIPMENT AND METHODS

The American Mining Congress, for example, has organized 19 subcommittees to study such subjects as ventilation, wire rope, ladders and stairs, drainage, transportation, explosives, illumination, fire fighting and mechanical loading as applied specifically to mining. The American Engineering Standards Committee, through its Mining Standards Correlating Committee, has appointed reviewing committees to assist in the final development of the standard. The personnel of each of these reviewing committees in-

By W. DEAN KEEFER*

cludes a group of 10 to 30 experts representing the leading organizations of the country interested in mining, thus assuring the development of a report or code that is technically correct and comprehensive in every detail.

The leading mine operators of the country are watching the development of these codes, and as rapidly as one is completed it is adopted as standard, to be used as a guide for engineers, superintendents, bosses, and others who have charge of mining operations. As mining methods are improved, these codes will be revised, thus assuring a proper presentation of the new and up-to-date ideas that can be recommended for immediate adoption.

STANDARDS FOR SAFETY EDUCATION

Experience has shown that the standardization of mining methods and equipment is extremely important in increasing production efficiency. It also helps in decreasing accidents and accident costs. Nevertheless, the safety education of bosses and miners is equally effective and necessary. The standards for safety education, though not developed in code form, are as easily obtainable as are standards for mining methods and equipment.

These educational standards particularly emphasize the need for employing or appointing one man to supervise the safety work at every mine. This man might be assigned such duties as investi-

gating all accidents, supervising first aid, fire fighting and mine rescue work, keeping records of accidents and safety suggestions, making safety surveys, supervising safety committees, etc. Without a safety man, educational work among the bosses and miners is likely to fail; success demands an organized plan well formulated and well supervised.

Emphasis is also given the necessity of selecting a sufficient number and the right type of bosses who not only know the safe and efficient methods of mining but who also have the ability to teach these methods to the men working under their supervision. In other words, organization has a great deal to do with the success of any educational program.

Bosses must then be given an opportunity to hold meetings from time to time to discuss their common problems—and accident prevention in particular. They should have access to mining journals and safety publications to increase their own funds of information which can be passed on orally to the miners.

Educating miners in safety is a job which challenges the ingenuity and ability of every mining official. New ideas are being developed continually that necessitate considerable flexibility in working out detailed methods. Yet certain activities have secured such substantial results that the underlying principles remain unchanged standards. Such activities include the use of safety posters, the publication of a company magazine, safety signs, rule books, suggestion systems, contests and classes in first aid, fire fighting and mine rescue, distribution of printed matter such as pay envelope inclosures, special letters, pamphlets and safety calendars, organization of safety committees, safety meetings, use of motion pictures and stereopticon slides, prizes and bonuses for safety, etc. Pamphlets on all of these and many other subjects can be secured from the United States Bureau of Mines, the National Safety Council, and other organizations.

If the annual toll of accidents in the mining industry is to be cut down to the point to which it should be cut, safety must be made an integral part of the operation of each mine. Contrary to the interpretation that is often given the term, standardization does not retard progress. On the other hand, it automatically eliminates nonessential and worthless variations, pointing a directing finger toward development along correct and reasonable lines.

MINE WATER AND ITS ACTION ON DRAINAGE EQUIPMENT

The Mine Drainage Section, Coal Mining Branch, National Standardization Division, The American Mining Congress has just appointed an industry-wide Committee to carry on a complete investigation in and an intensive study of the problem of acidulous mine water and its action upon drainage equipment. The Committee is composed of thirty operators from the various coal producing districts, and a cooperating Committee composed of the manufacturers of acid resisting metals, pumps and other drainage equipment.

* Chief engineer and director, Industrial Division, National Safety Council.

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Washington Monument and the Continental Memorial Hall

Harris & Ewing

"April — —

Laugh thy golden laughter—"

GOVERNMENT COOPERATION IN THE NATIONAL STANDARDIZATION MOVEMENT

More Than Two Hundred Groups Of Industry Are Participating In The Program Of Simplification And Standardization Inaugurated In 1921 By The Department Of Commerce, And Much Good Is Accruing To Industry As A Whole

By R. M. HUDSON*

SIMPLIFICATION and standardization, as practical methods of reducing waste, are now widely recognized throughout American industry.

Beginning with the issuance, in 1921, of the Hoover Committee's report of "Waste in Industry," interest has steadily increased until now more than 200 different groups are engaged in these waste-reducing activities. To the list comprising the American Railway Association, the American Society for Testing Materials, the American Mining Congress, the American Engineering Standards Committee, and other well known agencies, have been added such groups as the Federal Specifications Board, the Division of Simplified Practice, the American Marine Standards Committee, the National Committee on Wood, and the National Committee on Metals Utilization. More than a hundred other committees representing as many different commodity lines, from paving bricks to bathroom fixtures, might be named, if space permitted.

The results of these activities are steadily becoming better known and understood, and although at first it appeared to some there would be wasteful duplication of effort, the magnitude of the field, and therefore the relative opportunity for simplification and standardization, has provided amply for constructive effort, and conflict thus far has not been serious. There is, however, a recognized need for closer coordination, and more effective cooperation among all interests, to permit faster progress and to yield the maximum benefits possible in standardization. Steps toward this end are under way in accord with the announcement by the American Engineering

neering Council at its annual meeting last January.

This may be regarded as the final step in the "Nation-wide Program of Industrial Standardization" recommended in "Waste in Industry." This section of the report reads, in part:

"A nation-wide program of industrial standardization should be encouraged by the Government in cooperation with industry. In the standardization of design of product, methods of procedure, and number of models, there rests large opportunity for the reduction of waste."

"A special service the Government can render in this connection is the standardization of its own demands. Several Government departments have their own paper specifications, for example, with no relation to each other, or to any standard brand. These departments might well take the first step by standardizing the paper they use on the basis of a selected list of well-known brands."

"It is not sufficient, however, to attempt to standardize the product of a given industry, for almost every industry is so dependent upon others that they too must cooperate."

When Mr. Hoover became Secretary of Commerce, he established the Division of Simplified Practice to act as a centralizing agency, or clearing house, for bringing manufacturers, distributors, and consumers together to determine reductions in variety of sizes, dimensions, etc., of commonly used commodities. The division endorses and supports the work of such groups when they adopt recommendations of mutual benefit and value.

No attempt is made by the division to instruct or otherwise interfere with any industry—instead its services are rendered only upon specific request for such aid by the group or groups concerned. This policy has been most rigidly ob-

served and has proven an important factor in the success of the Government's participation in the national standardization movement. During the war, the Government took the initiative under the pressure to conserve manpower and materials, and literally forced many industries to simplify their lines and standardize their products.

Since the war, the Department of Commerce has assisted more than 60 industries to effect simplifications of their products, and is now cooperating with over 100 other industries in similar efforts. To date, 60 simplifications have been accepted by 778 trade associations and 4,386 individual companies or firms.

Through the Standing Committees sponsoring each simplification, and observing its success, re-surveys are made at regular intervals, usually annually. These annual audits show the extent to which the recommendations are applied in practice, i. e., actually incorporated or embodied in the products to which they apply. In 9 cases in the metals field, the average adherence was 85 percent, in 10 others in other fields 72 percent. In individual cases, the adherence ranges from 51 to 99 percent. These re-surveys also show the relative gain, or loss, in support from year to year for a specific simplification and thus provide the Standing Committees with authentic information on which to base revisions or other corrective actions.

Recognition of the fundamental importance of these systematic audits of adherence has resulted in one body, the American Society for Testing Materials, undertaking a review of the extent of use of its standards. Indications are that other organizations engaged in standardization will make similar studies of the adherence to their standards.

* Chief, Division of Simplified Practice, U. S. Department of Commerce.

SIMPLIFIED PRACTICE APPLIED TO CONSTRUCTION MATERIALS			
COMMODITY	FORMERLY	NOW	REDUCTION
PAVING BRICKS	66	4	94 %
ASPHALT	102	10	90 %
STEEL REINFORCING BARS	40	11	72½ %
METAL LATH	125	24	81 %
WOVEN WIRE FENCE	352	69	87 %
ASBESTOS MILLBOARD	10	3	50 %
EAVES TROUGH & CONDUCTOR PIPE	21	16	24 %
CONCRETE BUILDING UNITS	115	24	80 %
SAND LIME BRICK	14	3	78½ %
ROOFING SLATE	98	48	51 %
AVERAGE REDUCTION =			71%

SIMPLIFIED PRACTICE APPLIED TO MILL SUPPLIES, SHOP EQUIPMENT, etc.			
COMMODITY	FORMERLY	NOW	REDUCTION
FILES AND RASPS	1351	496	65%
FORGED TOOLS	665	351	47%
PLOW BOLTS	1500	840	44%
SHEET STEEL	1819	263	85%
MILLING CUTTERS			35%
DIE HEADS-SELF OPENING			75%
GRINDING WHEELS	715200	255800	64%
AVERAGE REDUCTION =			59%

SIMPLIFIED PRACTICE APPLIED TO GENERAL SUPPLIES & FURNISHINGS FOR HOMES, HOTELS, HOSPITALS, CLUBS, ETC.			
COMMODITY	FORMERLY	NOW	REDUCTION
BEDSTEADS, SPRINGS & MATTRESSES	76	4	95%
BED BLANKETS	76	12	85%
STERLING SILVER PLATWARE	190	62	67%
TINWARE-GALVANIZED JAPANNED	1154	673	24%
MILK BOTTLES	49	9	82%
MILK BOTTLE CAPS	29	1	96%
HOTEL CHINAWARE	700	160	77%
RESTAURANT CHINAWARE	668	177	73%
DINING CAR CHINAWARE	700	113	84%
HOSPITAL BEDS	67	4	94%
STEEL LOCKERS	65	17	74%
AVERAGE REDUCTION =			76½%

SIMPLIFIED PRACTICE APPLIED TO BUILDING MATERIALS - EQUIPMENT - FITTINGS - ETC.			
COMMODITY	FORMERLY - NOW - REDUCTION		
FACE BRICK - SMOOTH	36	1	97 %
" " - ROUGH	39	1	97½ %
COMMON BRICK	44	1	98 %
LUMBER, SOFT WOOD, YARD SIZES			60 %
HOLLOW BUILDING TILE	36	19	47½ %
BUILDERS HARDWARE - ITEMS			26 %
" " - FINISHES			71 %
SIDEWALK LIGHTS - SIZES	120	5	95 %
PAINT AND VARNISH BRUSHES	460	130	71 %
PAINT AND VARNISH - HOUSE PAINTS	32	28	12½ %
BLACK BOARD SLATES	251	25	90 %
TACKS AND NAILS	425	101	36 %
AVERAGE REDUCTION = 72½ %			

SIMPLIFIED PRACTICE APPLIED TO BUSINESS DOCUMENTS	
WAREHOUSE RECEIPTS STOCK DELIVERY FORMS - ETC.	EACH PREVIOUSLY MADE IN A THOUSAND DIFFERENT FORMS
INVOICE, INQUIRY AND PURCHASE ORDER FORMS	NOW THERE IS ONE STANDARD FORM FOR EACH OF THESE DOCUMENTS
BANK CHECKS NOTES, DEPOSIT SLIPS, NOTICES - ETC.	
AVERAGE REDUCTION 99½ % - ESTIMATED	

SIMPLIFIED PRACTICE APPLIED TO PLUMBING		
COMMODITY	FORMERLY - NOW - REDUCTION	
STRUCTURAL SLATE FOR PLUMBING PURPOSES - ESTIMATED		84 %
RANGE BOILERS	130 13	90 %
HOT WATER STORAGE TANKS	120 14	88 %
BRASS LAVATORY AND SINK TRAPS	1114 72	94 %
AVERAGE REDUCTION = 89 %		

Aside from the cooperative relationship above outlined, the Federal Government is interested in industrial standardization in two definite ways: first, as a purchaser, and therefore concerned with specifications for a wide range of materials, supplies, and apparatus or equipment; second, through the part its several service and research bureaus play in the experimentation and testing essential in the development of truly national standards.

As a purchaser, the Government has in the Federal Specifications Board (organized under the Bureau of the Budget in 1921), an agency for developing specifications for commodities required by the Government. The board is composed of representatives of each of the purchasing units of the U. S. Government, the Chairman of the Board being the Director of the Bureau of Standards. The purpose of the board is to unify Government specifications and to bring them into line with the best commercial practice. To date, the board, in cooperation with manufacturers of the lines affected, has adopted over 460 specifications with consequent saving to the manufacturers and to the taxpayers.

Government cooperation and participation in standardization from the service or research angle is typified by the work of the Bureau of Mines through its system of approval of electrical equipment and of permissible explosives, i. e., those found to be safe for use in explosive mine atmospheres. Records for 15 years show that, while 71 mine explosions were caused directly by the use of black powder or dynamite, resulting in death to 857 men and injury to 173 others, no case is known where an accident has been directly caused by one of the permissible explosives. It is important that approval of machines, equipment, etc., be uniform throughout the several states, otherwise the problem of supervision is complicated, the expense to the mine owners or operators increased, and the manufacturers burdened with a needless variety in their products of a common nature and for a common purpose.

In conjunction with the American Engineering Standards Committee, the U.

S. Bureau of Mines is either sponsor, or joint sponsor, for the following projects:

Permissible portable electric mine lamps.

Safety rules for installing and using electrical equipment in coal mines.

Storage battery locomotives for use in gaseous mines.

Ventilation in coal mines.

Ventilation in metal mines.

Safety code for coal mine illuminations.

The bureau is also cooperating in 15 other projects under the procedure of the American Engineering Standards Committee, suggesting subjects for, and determining the desirability of, standardization in the mining fields. It defines, and limits the scope of the projects, adjusts conflicts, clears up ambiguities, and in short, correlates the work of the group of sectional committees with which it is in contact.

The National Bureau of Standards likewise cooperates with the American Engineering Standards Committee, the Bureau of Mines and other organizations concerned with problems of the mining industry.

For example, the Bureau of Mines and the Bureau of Standards cooperated in a series of tests to determine the strength of iron ore pillars. In connection with this investigation, apparatus was developed for measuring the elastic properties of ore, and the lateral expansion of specimens due to compression.

Tests have also been made of plain and reinforced concrete mine stoppings employed to prevent explosions pene-

trating from one portion of a mine to another.

The investigation of mine scales by the Bureau of Standards was inaugurated in August, 1917. Generally, these scale tests by the bureau, have a very favorable effect. In cases where the scales are found correct, distrust and suspicion are allayed; and where they are found incorrect and corrective measures are applied, confidence is restored.

The bureau also tests railroad track and other scales and through its highly standardized test methods, the mine owner is assured that weights of his products in transit from mine to customer will be accurately determined. This is highly important to the mine owner since these weights are the basis of revenue to him and also to the railroad companies.

Early in 1926, the Bureau of Standards issued the "National Directory of Commodity Specifications." Over 27,000 commodity specifications are listed in this directory, in the preparation of which numerous engineering, trade and other organizations cooperated. This effort to produce a comprehensive list of existing specifications brought out the necessity for further simplification and standardization, since these 27,000 specifications apply to but 5,000 commodities. In some cases, as many as 50 different specifications were found for a single commodity. It is believed this diversity in specification reflects an unnecessary variety in product which can be reduced with benefit to manufacturer, distributor and consumer alike. Meantime, the directory is being widely used by purchasing agents, engineers and others having to do with the specification and procurement of materials.

Since 1921 various industries and trades have set up committees, to the number of 343 in 1926, to study simplification and standardization in their respective fields, and to make such use of the cooperative services of the Department of Commerce, as may apply in the solution of their problems.

As a result of the experience gained by these committees, the metal-using industries proposed to Secretary Hoover

SIMPLIFIED PRACTICE DECREASES STOCKS RAILROAD STORES			
	FORMERLY	NOW	PER CENT REDUCTION
LUMBER ROUGH & SURFACED	1082	821	24
FINISHED CAR & LOCOMOTIVE PARTS	2040	1299	36
BAR IRON	486	67	86
SOFT STEEL BARS	461	284	38
STEEL SHEETS ¾ AND UNDER	963	696	27
STEEL PLATES OVER ¾	1313	1164	11
FIRE BOX STEEL PLATES	183	161	11
AVERAGE 33.			
IN 12 MONTHS ONE ROAD ELIMINATED 4,936 ITEMS. ANOTHER, 3,457. A THIRD, OVER 7,000.			
RAILWAY AGE, MAY 23, 1925 P. 1276			

WASTE REDUCTION METHODS

- 1-DIRECT REDUCTION.
IMPROVE SUPERVISION. STOP LOAFING, SPOILAGE, AND WASTE OF MATERIALS, SUPPLIES, LIGHT, POWER, FUEL, WATER, ETC.
- 2-SALVAGING.
COLLECT, SORT, BALE, SELL.
- 3-RECLAMATION.
COLLECT, SORT, REPAIR, RE-ISSUE.
- 4-BY-PRODUCTS.
RECOVER, UTILIZE, MANUFACTURE, SELL.
- 5-INTENSIVE USE OF FACILITIES.
STUDY USE AND CAPACITY. OVERCOME IDLENESS.
- 6-REVISION.
FACILITIES, METHODS, PROCESSES, PRODUCTS.
- 7-REGULARIZE OPERATION.
ELIMINATE IRREGULARITY.
- 8-SIMPLIFY VARIETIES OF PRODUCT SIZES, GRADES, ETC.
- 9-STANDARDIZE PRODUCT, MATERIALS, EQUIPMENT, PERFORMANCE.
- 10-DEVELOP CONTINUOUS COOPERATION.

"MANAGEMENT AND ADMINISTRATION"
MAY AND AUGUST 1923

INCREASE IN OUTPUT PER MAN-HOUR

YEAR	AUTO- MOBILES	COBALT	IRON AND STEEL	FLOUR MILLING	LEATHER	CANE SUGAR	PULP AND PAPER	BOOTS AND SHOE
1914	100	100	100	100	100	100	100	100
1919	141	101	96	95	110	78	100	115
1921	214	121	93	120	132	81	90	122
1922	264	—	129	—	—	—	106	120
1923	295	129	130	126	135	101	110	121
1924	189	140	128	133	134	113	120	115
1925	310	157	149	139	128	127	125	116

CONTRIBUTING FACTORS:-

- 1-LABOR SAVING MACHINERY
- 2-WASTE ELIMINATION
- 3-HIGHER WAGES
- 4-SCIENTIFIC RESEARCH
- 5-WIDER USE OF STATISTICS
- 6-BETTER COOPERATION

INDEX NUMBER OF
BUREAU OF LABOR STATISTICS
U. S. DEPT. OF LABOR 1926

APPLIED SIMPLIFICATION

MISCELLANEOUS		METALS FIELD	
COMMODITY	ADHERENCE %	COMMODITY	ADHERENCE %
BEDS, MATTRESSES & SPRINGS	51	SHEET STEEL (JOBBERS)	53
SAND LIME BRICK	62	BRASS SINK TRAPS	75
HOSPITAL BEDS	69	HOT WATER STORAGE TANKS	82
ASPHALT (GRADES)	74	STEEL BARRELS & DRUMS	84
PAVING BRICK	74	STEEL REINFORCING BARS	85
FACE BRICK	74	WOVEN WIRE FENCE	97
MILK BOTTLES & CAPS	75	EAVES TROUGH & CONDUCTOR PIPE	97
LUMBER	80	METAL LATH	99
SHOT GUN SHELLS	81	RANGE BOILERS	99
HOLLOW BUILDING TILE	84		

AVERAGE — 72.4%

AVERAGE — 85.6%

GRAND AVERAGE = 79%

FROM RECORDS BY STANDING COMMITTEES
DIVISION OF SIMPLIFIED PRACTICE
NOVEMBER 20, 1926

that there be set up a special organization to develop programs for the elimination of waste in their field. The National Committee on Metals Utilization, organized in 1926, is composed of manufacturers, distributors and consumers of metal and metal products. The committee is an impartial body made up of all branches of industry and trade interested in closer metal utilization, better manufacturing, distributing, and metal-using practices. It is the purpose of the committee to carry the principles of Simplified Practice more deeply into the metals-using field. Unification of specifications and the discontinuance of certain undesirable trade practices are also included in its work.

The committee helps to establish a singleness of purpose in the minds of the manufacturers, distributors, and users in any metals industry, and also acts as a clearing house in bringing together the various elements in several industries that share the same problem. The work of the National Committee on Metals Utilization is an extension of the service of the Division of Simplified Practice, with emphasis placed on a consideration of metals and metal commodities, and with the effort broadened to include specifications and trade practices.

The National Committee on Wood Utilization, organized at the direction of President Coolidge, is composed of manufacturers, distributors, and consumers of lumber and wood products. It works in close cooperation with official and private agencies. It has, for its object, the utilization of wood in any form which, at present, is either wasted or not properly used. The committee's headquarters is in the Department of Commerce.

The work of the committee entails new or improved methods of converting wood into finished products, better methods of seasoning and handling, and the most economical methods of using forest products. It also includes a comprehensive project of standardization so that the raw material required by each wood-using industry may be manufactured to the greatest possible extent at the source. In this manner the consumers will be enabled to use wood with the minimum amount of waste.

This elimination of waste in all branches of the lumber industry and trade, and a closer utilization of the standing timber, will increase the returns from timberlands without making the raw materials more costly to the consumers. By converting a larger percentage of the tree into marketable products, it will greatly aid in putting reforestation on a commercial basis, thereby insuring the nation a permanent timber supply.

The National Committee on Wood Utilization, in cooperation with the mining industry, is making a study of the subject of elimination of waste in the utilization of mine timbers, with particular reference to use of treated timber. The purpose of this study is to correlate and summarize available data issued by Bureau of Mines, U. S. Forest Service, State Forestry and Mining Departments, American Mining Congress, and Institute of Mining and Metallurgical Engineers, on sources of waste in utilization of wood in mines, and to present data on methods and recommendations for decreasing waste.

Developments in the industrial standardization movement have unquestion-

ably been accelerated during the last few years by the Government's cooperation. Under that stimulus, important progress has been made in the mechanical and other industries. Recognizing the need for greater standardization in the mining industries, the American Mining Congress organized its present Standardization Division. This organization was started about the same time that the Division of Simplified Practice was established in the Department of Commerce. The work and growth of the Standardization Division of the American Mining Congress is characteristic of the magnitude and importance attached to standardization in typical American industries.

Simplified Practice programs adopted under the auspices of the Division of Simplified Practice and likely to be of particular interest and importance to the mining industry as a consumer, are woven wire fencing, hollow building tile, roofing slates, lumber, forged tools, builders' hardware, steel barrels and drums, steel reinforcing bars, sheet steel, concrete building units, cafeteria and lunchroom chinaware, steel lockers, milling cutters, paint and varnish brushes, grinding wheels, shovels, spades and scoops, bank checks and notes, die head chasers, steel reinforcing spirals, classification of iron and steel scrap, carbon brushes and shunts, wrought iron and wrought steel pipe, valves and fittings.

To the mining field, this service of the Department of Commerce is available in simplifying major and accessory equipment, supplies, and tools, and in supporting the action of the industry in any simplifications or standardizations which a joint conference of all interests accepts as the basis of greater stability, lower costs, and better profits or values to all concerned. The further application of simplification and standardization throughout the mining industry will undoubtedly help to decrease the stock of spare and repair parts that must be carried, for its machinery and thus reduce inventory and idle investment. This will help to lower production costs, reduce operating expenses, eliminate misunderstandings, and to increase net earnings.

UNDERGROUND POWER TRANSMISSION AND POWER EQUIPMENT

During the year 1926 the Underground Power Transmission and Power Equipment Section of the Coal Mining Branch, National Standardization Division, The American Mining Congress, secured the final approval of the American Engineering Standards Committee on their recommendations, which took the form of "Safety Rules for Installing Electrical Equipment Underground." The United States Bureau of Mines and the American Mining Congress were joint sponsors on this project, and the Bureau has reprinted the recommendations as a Technical Paper. Copies of this Code are obtainable from either of the sponsors, and it is also included in the Handbook of Standard and Approved Coal Mining Methods, Practice and Equipment.

PERMISSIBILITY TESTING AS A MEANS OF OBTAINING SAFER PRACTICES IN MINING

Bureau Of Mines Work On Permissible Apparatus And Material Relates Largely To Prevention Of Ignition In Gassy Coal Mines—That Accidents From Explosions Are Comparatively Few Speaks Well For The Work

By GEORGE S. RICE*

TWO centuries ago when coal mining got beyond the primitive stage of "pitting" along the outcrop and through shallow cover, and a network of underground passages was required to extract the coal, fire damp was encountered and explosions began. Efforts to prevent these led slowly, step by step, to coursing of the air in mines. Coursing was more or less crude at first but gradually the methods improved. This was not sufficient, however, to prevent explosions and remedies were sought to prevent ignition of gas. In mines where gas was found, the search led to the use of the wheel and flint for dim illumination by frictional sparks, in place of the torch. The flint and wheel gave such a meager light that when Sir Humphrey Davy invented the lamp which bears his name, in 1815, it was thought that troubles from the burning of fire damp and explosions would be over. This, however, was not the case and explosion disasters of increasing magnitude, corresponding to the increase in size and depth of mines, continued. The safety lamps with their poor illumination were used only in acknowledged gassy mines, but trouble came from the fact, which was not fully appreciated, that practically all coal mines are potentially gassy.

By 1900 the flame safety lamp had become greatly improved and fairly well standardized, and the method of testing for official approval for safety lamps was established in the leading European countries. In the United States comparatively few mines were rated as gassy and these accepted the foreign safety lamps without distinction as to their relative safety. Other causes of ignition besides open lights arose through blasting, which as a means of intensive production became more and more used in place of pickwork.

Towards the end of the last century there had been efforts to obtain safer methods of blasting, as by special stemming—such as wet moss or wood pulp—to prevent ignition of gas. Coal-dust at the time was not regarded as a serious menace if fire damp was not present; but its inherent danger was increasingly realized.

Then followed, first in Germany, the development of what were termed "safety explosives," which contained

salts to cool the flame. Finally in Belgium, Germany, Austria, and England official testing was begun of specific explosives. Those passing the test were termed "permitted" explosives.

In 1908 when the U. S. Government started investigations of the causes and prevention of coal-mine explosion disasters, an experiment station for the testing of explosives and safety lamps was established at Pittsburgh. The testing arrangements at first closely followed those of the European stations; for safety lamps the German practice was followed and for explosives, the British.

In 1909, certain explosives which had passed the selected tests were termed "permissible" explosives and were recommended for use in gassy and dusty coal mines.

Several years later, the Bureau of Mines following exhaustive testing, issued a list of permissible flame safety lamps.

About 1890 electric power made its first appearance in coal mines. Almost immediately it was set to work to drive underground machinery which had heretofore been driven by compressed air exclusively. Fifteen years later it had practically supplanted compressed air in coal mines. Valuable as electric power is, it can not be denied that its introduction into coal mines has greatly increased the hazard of ignitions of gas or coal-dust and of starting mine fires. Soon after the Bureau of Mines was established it began a study of what might be done to limit the hazards of electric power. The first application was in connection with electric under-cutting machines. A schedule of tests was formulated and official testing begun. Each respective machine was subjected to systematic testing in the presence of the persons who had submitted it, or of their representatives, with a view to making

the respective apparatus or machine of such design and construction that fire damp or fire damp and coal-dust would not be ignited. Continuous use in an explosive gaseous mixture was not contemplated.

The foregoing types of permissible apparatus and material, it will be observed, relate wholly to the prevention of ignition in gassy coal mines; this objective is still the principal work of permissibility, and with good reason. Although, as frequently mentioned by speakers and writers, that explosions form a very small proportion of the number of accidents which occur in coal mines, nevertheless were it not for the methods used today for adequate ventilation and for prevention of ignition coal mining would be practically impossible. That the accidents from explosions are so comparatively few speaks well for the progress which has been made.

It is frequently charged that, in spite of all the safety work done and all the safety devices introduced, the high accident rate in this country during the last quarter century has not fallen materially. What are the reasons? First, the enormous increase in the use of electrical power in coal mines in the United States, particularly since 1909, has greatly increased the risk of ignition of either gas or coal-dust. It has been difficult for safety to keep pace with the introduction of a valuable means of transmitting power. Second, with the mines becoming more extensive and in some places mining deeper coal seams, methane gas entering the mines has undoubtedly increased, although counteracted to a great extent by stronger ventilation. Therefore, had not the added safety measures been taken in prevention of ignition of gas by use of permissible lights, explosives, and machinery by many companies in gassy mining districts, explosions would undoubtedly be more frequent than they are.

The method of determining the schedule of tests for any particular device or machine employed by the bureau is first to investigate the field of use; second, the character of the apparatus on the market, or which are being offered as being designed to prevent ignition of gas or coal-dust. Following these studies and many preliminary tests, a "schedule of tests" is made up and manufacturers are invited to submit their products for testing for permissibility. If a machine or

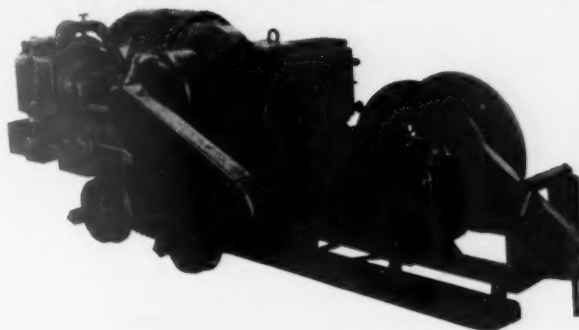


Permissible electric coal drill

* Chief mining engineer, Bureau of Mines, Washington, D. C.



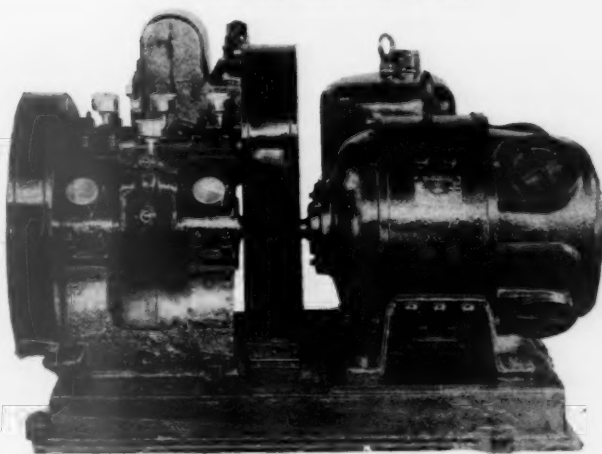
Permissible undercutting mining machine



Permissible portable air compressor



Permissible underground slope or room hoist



Permissible room pump

device fails to meet the scheduled tests no publicity is given to the fact and there is nothing to prevent a revised device or apparatus from being again submitted for testing for permissibility. When the device or apparatus or machine has successfully passed, it is given a name plate bearing the Bureau of Mines approval, which must be fastened on the machine.

So far as time permits, the bureau's limited staff from time to time observes the use of permissible equipment in mines and records any failures. If a failure is due to fundamental defects of construction, or, if it proves that the design should be improved, the bureau has not hesitated to revise its schedule of tests for the device, machine, or apparatus and to recall its former approvals. This particularly has to be done where the art has been advanced rapidly, notably so in the case of miners' electric lamps and in explosives.

CLASSIFICATION OF PERMISSIBLE MATERIAL, APPARATUS, OR MACHINE BY RESPECTIVE APPLICATION

At first the approval system of the

*A schedule of tests has been issued but as yet no approval issued.

bureau was directed wholly to application in gassy and dusty coal mines, but subsequently the work was broadened, and it is continuing to broaden. On the basis of purpose or application, permissible things may be grouped in the following general classes:

A. For prevention of ignition of inflammable gas or dust in these applications: (1) Explosives. (2) Flame safety lamps. (3) Portable storage battery lamps of several kinds. (4) Coal-cutting machines. (5) Loading machines and movable conveyors. (6) Storage battery locomotives. (7) Power trucks. (8) Air-compressors. (9) Portable room or slope hoists. (10) Coal drills. (11) Portable shot-firing units. (12) Pumps. (13) Electric switches and junction boxes. (14) Mine telephones.* (15) Rock-dusting machines. (16) Flash lamps. (17) Methane detectors or indicators employing hot wires or flame.

B. For detection or measurement of inflammable or poisonous gases in air: (1) Methane detectors or indicators (embracing those under Class A, 17) for protection against ignition. (2) Carbon monoxide detectors.*

C. For protection of life in irrespirable gases: (1) Self-contained mine rescue oxygen breathing apparatus for use in

any atmosphere. (2) Gas masks for use in irrespirable gases, but not where there is serious deficiency of oxygen.

The whole approval system comprehends practicability of use and durability for a reasonable time of the respective materials, devices, and machines, but does not determine the relative mechanical efficiency above the specified limits of permissibility. It is not probable that approval of mechanical efficiency by itself could be undertaken with the constant improvements in the respective art and with the great variation of conditions found in different applications.

From time to time, as there is demand on the part of mine operators for protection against ignition of gas or dust by a machine developed for special use, the bureau issues, after investigation, a schedule of testing, and invites submission by manufacturers of the respective machine or device. There are, however, some classes of machines of portable character, the application of which, in the opinion of the bureau, might be dangerous, and for which the bureau does not deem it best to give approvals.

In the present rapid development of mechanization of mines, the greatest demand for permissibility approvals is for special types of (Continued on page 314)

PROGRESS IN MINE TIMBER PRESERVATION IN U. S. AND EUROPE

Report Of Timber Preservation Committee Shows Progress In Mine Timber Preservation During 1926 — Special Investigation Conducted On Timber Preservation And Treatment In Central Europe

By GEO. M. HUNT*

PRESERVATIVE treatments for mine timber continued to receive serious attention during the year. There appears to be a growing tendency to study the problem and weigh the possibilities of effecting significant economies in operating costs and timber by the use of preservatives. The Committee on Mine Timber Preservation of the Standardization Division, American Mining Congress, has knowledge of several cases where decisions as to the adoption of a timber treating policy are pending but it is not at liberty to discuss them until the decisions have been announced. Favorable action in these cases, when announced, will be very effective in spreading the practice to other mines.

The Philadelphia and Reading Coal and Iron Company has had a pressure treating plant near Pottsville, Pa., for many years, and it has given very satisfactory results. Mr. L. W. Conrad, superintendent of the Timber Department of this company, states that they are now to build a second plant, which will be located at their Ellangowan Colliery, at St. Nicholas, Pa. The new plant will have a treating cylinder 6 feet in diameter and 85 feet long, with a capacity of about 3,000 cubic feet of timber a day. The plant will be completely equipped to treat by the full cell pressure process. It is expected to apply vacuum first and then inject the preservative under pressures of 100 to 125 pounds per square inch to the refusal point. Loblolly pine timber from Virginia and North Carolina will be the principal species used. It is very well suited to preservative treatment, as it absorbs preservatives easily. It is the intention to treat all timber and ties for the permanent haulageways in each of their 14 collieries in this district, and probably some ties and lumber for surface structures. The treated timber can be distributed from the plant either in mine cars or by auto truck.

Sodium fluoride has been used at the Pottsville plant for 10 years, and even the earliest treated timbers are still in good condition, where untreated timber has an average life of about three years. On the basis of this satisfactory record the company has decided to use sodium fluoride at the new plant for all underground timber and ties. It may later decide to employ creosote in some of its ties and lumber for surface use.

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The H. C. Frick Coke Co. contemplates building a pressure treating plant in the spring of 1927 at a point near the Monongahela River, in Fayette County, Pa. It is expected to treat at the outset a mini-

perservative, called Cresol, which consists of 95 percent of an asphaltic base petroleum and 5 percent cresylic acid. In the near future it is planned to change over to the use of arsenical solutions.

In order to care for the treated timber requirements of the mines while the pressure plant was not operating, an



Fig. 1. Typical German pressure plant for mine timber treatment, housed in a brick building

mum of about 270,000 cubic feet of timber per year, consisting mainly of mine ties, but with some quantity of timber to be used outside of the mine. The quantity of surface material treated is expected to increase as the value of treatment is better determined. The timber will come to the plant by rail and will be stored for seasoning before treatment. After treatment it will be delivered to the adjoining mines by automobile truck. The plant will be designed to treat with either water soluble salts or with creosote, but creosote will not be used on material going underground.

The United Verde Copper Co. is to build a small pressure treating plant with a treating cylinder 5 feet in diameter and 19 feet long, having a capacity of approximately 370 cubic feet. Wolman salts will be used as the preservative, and it is expected to have the plant in operation in the summer of 1927.

The Anaconda Copper Mining Co. has had a pressure treating plant in successful operation at Rocker, Mont., for many years and has demonstrated the effectiveness of creosote treatment. The plant was out of commission for about nine months in 1926 because its steam supply was shut off when the framing mill was destroyed by fire. It resumed operations in October, using, instead of coal tar creosote, a cheaper proprietary

open tank was built at the Leonard mine.

The treating vat of this plant is 10 feet by 6 feet by 6 feet, and has a capacity of 11 mine sets per charge. There are two solution tanks, one for hot solution and one for cold, which hold 1,200 gallons each. The plant is situated on the face of an old mine dump, the slope of which permits a rapid exchange of hot and cold solutions by gravity. Pumping, when necessary to raise the solutions back to their tanks, is done with a centrifugal pump of the type commonly known as a "sand pump." It was found to be very efficient. The steam coils in the treating vat are protected from damage by spacing rails over them about 8 inches apart. The timber is handled two or three pieces at a time in slings of one-fourth inch steel cable, which are left on during treatment to facilitate removal of the timber after treatment. Floating of the timber is prevented by placing 16-pound rails across the charge and inserting their ends in notches in steel plates fastened to the sides of the vats.

During the past two years the Anaconda Company has started a number of service tests and has installed timber treated by open tank or by pressure with the following preservatives: Minolith, Ac-Zol, Cresol, and solutions of arsenical salts. The results of the inspections of

these timbers will be very useful. The arsenical solutions are not known to have been used before.

The Colorado Fuel and Iron Co. built an open tank creosoting plant at Primero, Colo., in 1922, because timber in the main haulageways was decaying in about three years. An excellent illustrated description of this plant and its operations was printed in THE MINING CONGRESS JOURNAL for July, 1926. All treated timbers are marked with dating nails which show the month and year when placed in service. The first creosoted timber was installed in February, 1923, side by side with untreated timber for compari-

pine. The average zinc chloride retention was .71 pound per cubic foot, and the average cost of treatment \$10.66 per thousand board feet. Treated timber is used for all underground installations where a life of more than two years is desired. Practically all of the treated timber is marked with the date of installation by means of a stamped copper tag. In several instances sets of treated Douglas fir, untreated Douglas fir, and untreated Port Orford cedar have been placed under identical conditions. After the lapse of 16 months none of these timbers are showing decay. The observation of these timbers will continue.



Fig. 2. Timber storage yard of a large mine in the Ruhr District

son. An inspection in April, 1926, over three years later, showed the untreated timber so badly decayed at the bottom that the entire length of a 4-inch knife-blade could easily be pushed into it. The creosoted timber was as good as new.

In July, 1922, several sets of timber treated by soaking in a 6 percent solution of Ac-Zol were installed in the mine. In 1926, since the entry where this material was placed had been closed, the treated sets were recovered and placed in the main air course. All but three sets were found in as good condition as when placed, while untreated timber in service near by was so badly decayed it was not worth recovering. The three sets of Ac-Zolated timber which showed decay were found to have been sawed off at the bottom to make them fit when they were originally placed, which, of course, is not permissible with treated timber. These and other experiments have demonstrated the value of treatment at the Primero mine, although the ultimate life of the treated timber has not yet been reached.

The Miami Copper Co. has continued to operate its zinc chloride pressure treating plant, in which a total of over 550,000 board feet was treated during the first 16 months after the plant was placed in commission in June, 1925. The timber treated was all Douglas fir, with the exception of a few thousand feet of Texas

The Rochester and Pittsburgh Coal and Iron Co. for the past eight years has been treating its timbers in an open-tank plant with carbolineum, and the results have been very good. The treated timber has not been in service long enough yet to determine its average life, but untreated timber put in at the same time has been replaced for decay. It is expected that the treated timber will remain in service for another five or six years, possibly longer. They are now building a pressure plant at Indiana, Pa., to take the place of the old plant. It will have a treating cylinder 5 feet 6 inches in diameter and 24 feet long, and will be equipped to use either creosote or water solutions. The new plant will begin operations about January 1, 1927, and will supply treated timber for 37 associated mines. It is planned to treat all ties, drift timbers, shaft timbers, lagging, tippie floors, and all outside mine building and construction timbers. Over 100,000 ties will be treated per year.

The Cleveland-Cliffs Iron Co. has been using zinc chloride in open-tank equipment for three years with excellent results. The following statement by Mr. J. L. Hyde discusses their experience with timber treatment to date and points out the importance of thorough seasoning of the timber before treatment.

HISTORY AND RECORD OF TREATED TIMBER IN THE ATHENS MINE, CLEVELAND-CLIFFS IRON CO., NEGAUNEE, MICH.

In January, 1923, treated timber was first placed in main levels in the Athens mine, to replace untreated sets in ground which was not crushing. This timber consisted of hard maple, yellow birch, tamarack, and hemlock, and was 8 feet in length and from 12 inches to 14 inches in diameter at the small end. Treatment was given by an open-tank process, using a 4½ percent solution of zinc chloride as the preservative agent. The average length of treatment was an immersion of four hours in a hot solution and another of four hours in a cold solution. The average maximum temperature obtained was 130° F. and the minimum 60° F. Timber treated during 1923 was green, having seasoned for a very short period, with the result that the maximum penetration secured was never greater than one-eighth inch and the absorption practically negligible. Approximately 332 pieces were placed in the Athens mine during this year and, as this report is written, only 99 pieces have been removed, leaving 233 pieces still standing and in fairly good condition, although a large number are beginning to show some evidence of decay. (See chart.)

During 1924 several improvements were made at the plant, resulting in a more effective treatment. A greater head of steam was obtained, which made it possible to secure a maximum temperature in the hot solution of 160° F. Drainage tanks were installed, eliminating handling of timber from one operating tank to the other. Timber was peeled earlier and allowed to season for a longer period, and experiments were conducted on penetration and absorption in the various species of wood. These latter experiments early showed that hard maple and yellow birch were better adapted to treatment by the open-tank process than were hemlock and tamarack, which caused the elimination of the latter species for treatment in 1925. During this year more powerful fans were put in operation in the Athens mine, increasing the air circulation to all parts of the mine. An improvement in results obtained from treatment was shown during this year. The average penetration was increased to one-fourth inch and the average absorption per cubic foot to one-fourth pound. During the year 1924, 665 pieces were treated and placed in the Athens mine. At the present time none of this material has been removed. (See chart.)

By 1925 it had been clearly demonstrated that the proper seasoning of timber before treatment was possibly the greatest factor in increasing the penetration and absorption of the preservative. With this knowledge, steps were taken to accumulate a timber reserve

over and above annual requirements, which would permit timber to be peeled and seasoned at least a year before being treated. The small amount of timber which was reserved in 1925 for a year of seasoning was treated and tested, the results obtained being beyond expectations. The average penetration on this timber was three-fourths of an inch and the average absorption per cubic foot was slightly less than one-half pound of preservative. A sufficient reserve has been accumulated during 1926 to carry over to 1927, when it will be treated.

During 1925, 663 pieces were treated and placed in the Athens mine and 542 pieces during 1926. (See chart.) None of this timber has been removed, and with a few exceptions all timber placed since 1923 is in a sound condition.

Prior to 1923, the average life of main-level timber in the Athens mine was one year from the date of installation to the date of removal. By treatment, and improved air circulation, this life has been increased approximately three years, with the maximum life not yet in sight.

COMMERCIAL TREATMENTS

Commercial treating plants have shown some activity during the year in seeking mine business. One company reports the treatment of about 15,000 mine ties and 15 to 20 carloads of timber for three widely separated mines. Some mine business has also been done by other commercial plants. Many mines are so situated that they can conveniently arrange for the treatment of their timber at commercial plants. Sometimes advantage can be taken of treating in transit rates and in some cases the treating company has access to cheap timber supplies which make savings possible to the purchaser. The commercial plants can furnish much better treatment than is usually obtained in open-tank plants and probably at no greater cost. They afford an opportunity to the mines to secure all the advantages of timber treatment without going to the expense and inconvenience of erecting and operating plants of their own. Commercial plants in the past have concerned themselves chiefly with railroad business and have given little attention to the mining industry, but a number of them are now seeking mining business, and one is being established in Pennsylvania which proposes to make a specialty of mine timber treatment. It is hoped that the activities of these treating plants will increase,

because an increase of business of this kind will react to the benefit of the mining industry.

WOOD-PRESERVING STATISTICS

The extent to which wood preservatives are used in the United States and the progress which has been made in extending the practice during the last 18 years are shown in the statistical report

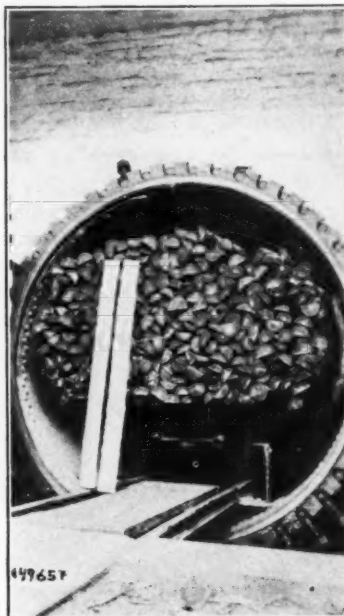


Fig. 3. Pine lagging made from small timbers sawed in half lengthwise and treated with a preservative (Ruhr District)

published annually by the U. S. Forest Service and the American Wood Preservers' Association under the title "Quantity of Wood Treated and Preservatives Consumed in the United States." The latest report, giving statistics for 1925, shows that nearly 275,000,000 cubic feet of wood were given preservative treatment in that year, requiring a total consumption of over 26,000,000 pounds of zinc chloride, nearly 170,000,000 gallons of creosote and paving oil, 13,000,000 gallons of petroleum (for mixture with creosote), and a small quantity of miscellaneous preservatives. The report also shows the quantities of different forms and species of timber treated, the character, location, and ownership of all wood preserving plants of record, and other useful information. It is a valuable report for anyone interested

in the statistical side of wood preservation. Copies may be obtained without charge from the U. S. Forest Service, Washington, D. C.; the Forest Products Laboratory, Madison, Wis.; or the American Wood Preservers' Association, 10 South LaSalle Street, Chicago, Ill.

NEW PRESERVATIVES

Certain proprietary preservatives of foreign origin have been actively pushed for some years as especially suitable for mine timber treatment, but there has been little concrete evidence concerning their effectiveness. The committee is able now to present some information on this subject in the attached report by Mr. Hunt, which covers the results of investigations made by him in Europe during the past summer.

MINE TIMBER PRESERVATIVES AND TREATMENT IN CENTRAL EUROPE

Proprietary preservatives of foreign origin have aroused much interest in the United States during the past three or four years because of the advertising and promotion work of the American concerns who are now manufacturing and selling them. A particular target of these sales efforts has been the mining industry, since it is practically a virgin field for the sale of wood preservatives and has not yet been cultivated very much by any preservative manufacturers.

The most important factor in establishing the value of a wood preservative is its performance in actual service, and the questions most frequently asked about the various foreign preparations have been, "What have they done under service conditions in Europe, and how extensively are they used there?" Adequate answers to these important questions have been lacking, and the writer therefore welcomed the opportunity to visit Europe during the spring and summer of 1926 to obtain first-hand information about wood preservatives and how they are used. The general object of the trip was a study of wood preservation and wood utilization, and it was possible to devote only part of the time to the question of mine timber.

To cover the subject properly one should spend about six months on mine timber preservation alone, for it is only by taking ample time that one can discover all the preservatives and methods in use and can get an intelligent perspective of the relative importance and effectiveness of each. In the short time available, therefore, it seemed best to concentrate on Wolman salts, Ac-Zol, and Basilit, the three foreign preservatives of greatest interest at present to mine operators in the United States, necessarily neglecting some other materials not now of any prominence but which it would nevertheless have been very interesting to study. Most of the

ATHENS MINE						
Year	No. Pcs. placed	No. Pcs. removed	Reason for removing and condition of timber when removed	Date of removal of timber	Average length of service	No. Pcs. still in service
1923	332 (est.)	99	Decay. This timber was treated green.	Feb., 1926, to April, 1926.	2 years, 9 months.	233 (est.)
1924	665	None				665
1925	663	None				663
1926	542	None				542

time was spent in visiting 13 coal mines in Germany, mostly in the Ruhr district, although one mine in Hungary and two in Czecho-Slovakia were visited, as were also the offices and laboratories of some of the companies in Belgium, Germany, and Austria that are promoting the sale of mine timber preservatives.

The investigation showed that a large number of the mine operators in Germany consider the preservative treatment of their permanent timbering to be practicable and profitable and that they have equipped themselves with excellent pressure treating apparatus for the purpose. The growth of the practice, in Germany at any rate, appears to have been more or less gradual and based upon continuous successful experience, and timber preservation now is recognized generally as standard. Since I did not get a chance to study mine timber treatment very much except in Germany, I can not say how extensive the practice is in other European countries.

The use of mine timber preservatives other than sodium fluoride-dinitrophenol mixtures such as Wolman salts and Basilit does not appear to be extensive in Germany and other central European countries. I was told of a few mines using coal-tar creosote, lignite tar, sodium cresylate, and even common salt. As a rule, oily preservatives are not looked upon with favor because the workmen do not like to handle them or work around them. There is also some concern about their possible fire hazard.

Ac-Zol was not being used at any of the mines I visited. According to the statistics of the manufacturers, Poland and Roumania use most of the Ac-Zol produced. I saw a few Ac-Zolated railway ties in Belgium which have given a fair record of service, but no other material treated with this preservative. I am unable therefore to report as to its effectiveness.

Of all the preservatives used at the mines, it was apparent that the Wolman salts enjoyed the greatest volume of business. To what extent this large share of the business is due to sales agreements with the manufacturers of other materials and to a more aggressive sales program on the part of the Wolman Company it is impossible to say, but these factors undoubtedly play an important part. I was unable to learn of any mine timber plant using zinc chloride or sodium fluoride alone, although these materials have given good results in the United States.

CHARACTER AND SOURCE OF TIMBER USED

The principal species of timber used at all of the mines visited is the common European pine (*Pinus sylvestris*) which grows in Germany and the rest of central Europe and in the Baltic countries. It is known under various English names, such as redwood, red deal, Baltic pine,

Danzig pine, Scotch fir, and other names referring generally to the place of growth or point of shipment. It has points of resemblance to the Norway or red pine growing in the northern part of the United States, to the shortleaf pine of our southern states, and to the western yellow pine of the Pacific coast and Rocky Mountain states. At some of the mines white oak is used for ties, chute lining,



Fig. 4. A charge of mine timbers steaming hot from a treatment that has just been completed (Ruhr District)

and other purposes where wear is heavy. The oak is more expensive than the pine, and is used in much smaller quantities.

The timber is fairly thoroughly peeled in the woods at the time of felling, which, in the case of pine, reduces the danger of early decay and excessive blue stain and favors rapid seasoning. From the time the timber is cut until it reaches its destination several months may elapse, so that it generally reaches the mines in a partially seasoned condition. The pine is shipped in the round form almost entirely, in diameters from about 5 inches up to 8 or 9 inches and in various suitable lengths. The pine timbers generally show a ring of sapwood from 1½ to 3 inches in thickness. This large proportion of sapwood is a decided advantage in making preservative treatments because the sapwood is easy to impregnate. It is a great disadvantage, however, in wood that is to be used without preservative treatment, because of the very low resistance of the untreated sapwood to decay.

When the timbers reach the mine they are piled cordwood fashion or stood on end in the storage yard until required. Neither of these methods of piling is to

be recommended, as both are very favorable to decay. In sappy pine timber, especially, serious reduction in strength will result if the wood is left very long under such conditions. It is better practice to open-pile the timber on skids so that the air can circulate freely through the piles and the wood can not touch the ground.

Although most of the bark is peeled from the timber when it is felled, the strips of bark that still cling to it when received at the mine interfere to some extent with the penetration of preservatives. This, however, is not considered enough of a disadvantage to justify the expense of further peeling. It would certainly interfere seriously with the penetration of creosote or other oils and prevent a satisfactory penetration, but only water soluble preservatives were being employed at the mines visited and these can get around strips of bark somewhat better than oils. It is the writer's belief, however, that even with water solutions, complete peeling is highly important and permits more thorough treatment.

TREATING EQUIPMENT AND METHOD OF OPERATION

The type of treating plant found in use at 13 of the 16 mines visited was a pressure plant with a cylinder about 6½ feet in diameter and 30 feet long. All the pressure plants were of simple but very practical design and very well adapted to the service. Mine timbers were undoubtedly treated in Germany prior to 1908, but the great development in the use of preservatives and in the installation of pressure treating plants appears to have taken place since that date. The oldest plant visited was a two-cylinder plant built in 1908 to serve three shafts. It is now to be entirely rebuilt and equipped with two new cylinders half again as long as the old ones. Two other shafts of the same company are provided with treating plants of their own. Next in age was a plant built in 1911 and two built in 1914. The others visited were built at various times since 1914, up to and including 1925, which indicates a steady and consistent growth in the use of preservatives and not a sudden, mushroom expansion likely to fade out again quickly.

The plants visited were, as a rule, housed in small, neat brick buildings provided especially for the purpose. One such plant built in 1925 cost between \$6,000 and \$6,500 complete, including the building. It has one cylinder 6 feet 10 inches in diameter and 36 feet long. Another plant, with a cylinder 6½ feet in diameter and 22½ feet long, was built in 1924 for a total cost of \$4,500, including the brick building.

The method of operating the pressure plants was pretty well standardized because they were all using the same kind of timber and the preservatives were all

water solutions. In most of the plants the preservative is drawn into the cylinder by vacuum and then pressure is applied to the preservative by compressed air. The treating conditions are regulated so as to inject about 12 to 14 pounds of the treating solution per cubic foot of wood. With a solution strength of 2 percent, which is common, this gives a net absorption of about $\frac{1}{4}$ pound of preservative per cubic foot. A typical treatment is as follows: Apply preliminary vacuum for $\frac{1}{2}$ hour, draw in hot treating solution (at about 160° F.) without admitting air, apply pressure of 50 to 120 pounds per square inch for at least one hour and until the desired amount of solution is absorbed, release pressure and drain preservative from cylinder, apply air pressure to the wood for about $\frac{3}{4}$ hour, release pressure, and remove the wood. The low pressures are used when the wood is very easy to treat and the higher pressures with wood that absorbs the solution less readily. Round pine timber is relatively easy to treat, so that neither a long treating period nor high pressures are usually necessary. The stated object of the final air pressure period is to increase the depth of penetration without increasing the amount of preservative absorbed. No evidence was available to show the extent to which this purpose was being accomplished. A recording gauge chart of a number of such treatments, in which medium pressures were used, is shown in one of the accompanying illustrations.

At two of the mines visited open-tank plants were being used. One was quite well equipped and operated so that fairly good results were being obtained, although the absorptions and penetrations were not as good as the pressure plants were giving. The other was a crude vat in an inconvenient corner, and the treatment being given was a mere formality. The sixteenth mine visited has been using commercially-treated timber, with good results, but has no treating plant of its own.

PRESERVATIVES USED AND SERVICE GIVEN

All of the mines visited were using one or another of the several sodium fluoride-dinitrophenol mixtures. Most of them were using Triolith, one of the Wolman salts. Two were using Minolith, another Wolman salt. Others were using Basilit, Malenit, or Fluoran, produced by other makers. The composition of all of these materials is such that they should be effective in preventing decay. The latter two have not been in use as long as the others and have not yet developed much evidence concerning their effectiveness. The last named did not appear to be at all well known. Minolith, Triolith, and Basilit, however, have shown their effectiveness in several experiments under service conditions and by long-continued use in a large number of mines.

Triolith and Basilit also have several records of good service in railway ties and poles.

The oldest records found were on Minolith, or, as it was formerly called, Gluckauf-Basilit. This preservative is in reality a mixture of common salt with Triolith. The common salt, which is not a good wood preserver, was added for the purpose of reducing the inflammability of the wood. It diluted the Triolith very greatly and made heavy absorptions necessary in order to get sufficient fungus poison into the wood.

In the Donnersmarkhutte A. G. mine at Hindenburg, Germany, there is a drift on the 575-meter level (Concordia shaft) which was cut for exploration purposes during the period 1911 to 1913. The first 800 meters from the shaft are supported largely with continuous brick and concrete lining. The next 600 meters (from M800 to M1400) are supported on Minolith treated timbers installed as the drift progressed in 1911. The 900 meters from M1400 to M2300 are on Minolith treated timbers placed in 1912. Five hundred meters more were cut in 1913 and supported on treated timber, but only 300 meters of it can now be seen as the drift is closed beyond the 2600-meter point. In fact, most of the drift is now used but very little. All of the treated timbers were purchased from a commercial timber treating plant, as the mining company did not build its own plant until 1917, when results of tests in this drift convinced them of the desirability of so doing.

I was permitted to inspect these timbers on June 9, accompanied by representatives of the Wollman Co. and by the mine foreman who was in charge at the time the timbers were installed. We found the floor of the drift quite wet, with a ditch of running water at one side, but the upper part of the drift fairly dry. The resulting condition of the timbers, wet at the bottom and dry at the top, is very favorable to decay. Upon careful inspection a considerable proportion of the timbering showed more or less decay, but on the whole it appeared to be in good condition and fit for several years' service yet. Usually when decay was found it was in the region between the very wet bottom part and the dry upper part of a post. There was also some rot in the tops or bottoms of occasional posts.

Most of the original timbers appeared to be still in place except for about 50 meters of the 1912 stretch that had caved in and been rebuilt. The timbers placed in 1911 were found in somewhat better condition than the others, apparently because they are located in a better ventilated section of the drift. The mine foreman stated that untreated timber would probably last about five years where the 1911 timbers are placed but

would rot more quickly farther along toward the end of the drift.

At the Königen Louise mine, also at Hindenburg, the confidence of the company in treated timber is evidenced by the fact that they have had a two-cylinder pressure plant in operation since 1908 (the oldest plant visited) and they are now planning to rebuild and enlarge it. I inspected a drift at this mine which had been enlarged and completely retimbered with Minolith treated timber in 1915. The drift is warm and wet and the conditions are very favorable for fungus growth. Quite a number of the timbers showed decay, but most of them appeared to be in fairly good condition after 11 years' service. In 1925 some untreated posts had been put in this drift as temporary supports for a flume. They are now badly decayed. Untreated lagging was used in the original installation and had to be renewed several times thereafter. The company have now turned to the use of treated lagging. They use about 2 $\frac{1}{4}$ million cubic feet of timber per year, of which 10 to 15 percent is treated before installation. This is close to the proportion of timber requiring treatment at the average mine.

An interesting side light on the confidence of the mine foreman in treated timber was his tendency to call all timber "untreated" which showed serious decay and to call the good ones "treated." While such a habit does not make for accuracy in the records, it nevertheless indicates a strong belief in the effectiveness of treatment. All of the early treatments at this mine were made with Minolith but the more toxic Triolith is now being used.

At Tatabanya, Hungary, I was shown some timbers in the mine of the Hungarian General Coal Mining Co. which were installed in 1914 after pressure treatment with Bellit, now called Basilit. We found only one timber showing decay out of perhaps 100 inspected. The superintendent said that no timbers had been removed except a number that had been taken out at different times for sectioning and examination, all of which proved sound. Many other treated timbers were installed in 1914, but they are in places which are now closed and inaccessible. From 1914 to 1922 no timber was treated because of the difficulty of getting preservatives during and just after the war. In 1922 treatment was resumed with Malenit, which is very similar to Basilit. This material has, of course, not been in service long enough to demonstrate its effectiveness conclusively.

Near Carlsbad, Czecho-Slovakia, in the mine of the Dux Bodenbacher Eisenbahn Gesellschaft, I saw another group of Bellit treated timbers which were installed in 1914. The mine superintendent who accompanied us under-

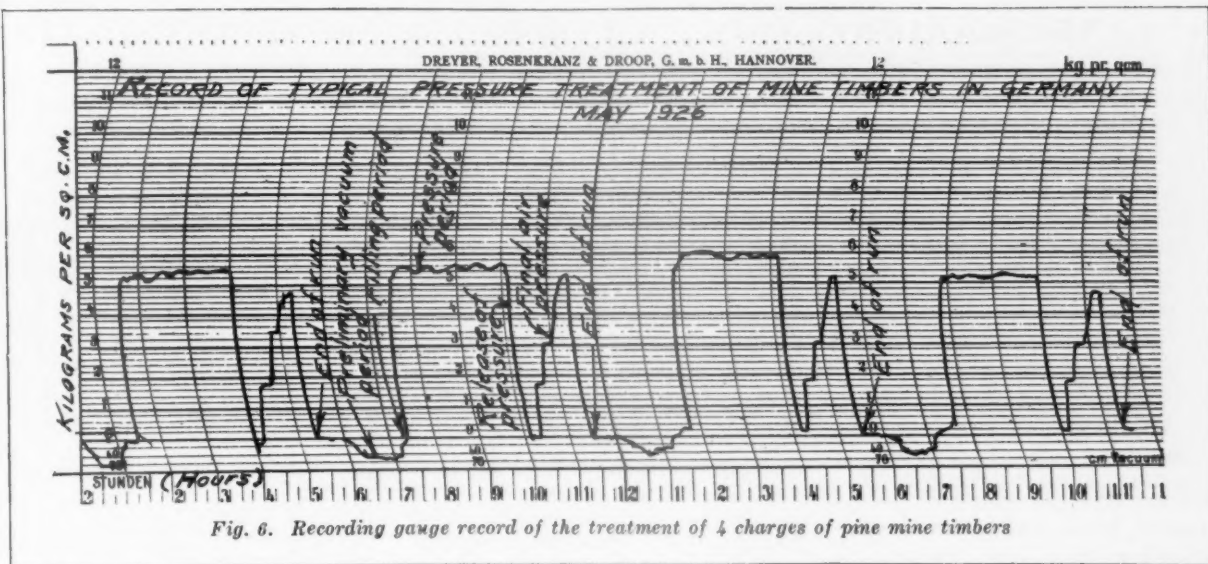


Fig. 6. Recording gauge record of the treatment of 4 charges of pine mine timbers

ground showed great interest in timber treatment and was well informed about the results being obtained in his own mine, where each set of treated timbers is marked with zinc tag stating the year of installation. They have not yet removed any of the 1914 Bellit treated timber on account of decay, and they expect to get eight years more service from it, or a total service of about 20 years. Untreated timber in the same place was said to last about one and one-half years.

During the war and immediately after they used a substitute material of unknown composition which failed to give satisfaction. Later they changed to Malenit and still later to another preservative of somewhat similar composition. The two latter are giving satisfactory results thus far, but have not been in service long enough to afford much information. The change to the newer preservatives was said to be due to their lower first cost. Whether the change will prove economical in the long run will naturally not be known for some years to come.

The cost of untreated pine mine timber delivered to the mines in the Ruhr district was said to be from 17 to 20 cents per cubic foot, and the cost of treatment from 6 to 7½ cents per cubic foot. The total timber cost per metric ton (long ton) of coal mined was said by several mine operators in this district to be from 20 to 26 cents. One stated that it was costing 5 to 7 cents more per ton in mines which do not use preservatives.

The following tabulation furnished by the general manager of one of the Ruhr mines visited is illustrative of the first cost of using treated and untreated timber:

COSTS PER PIECE, PINE MINE TIMBERS			
Length of timber	Cost without treatment	Cost of treating	Total cost of treated timber
Feet	Dollars	Dollars	Dollars
8	.50	.17	.67
9	.56	.19	.75
10	.62	.21	.83

The probable life of untreated timber, at this mine, is estimated at not more than two years, whereas the probable life of treated timber is not less than 10 years.

Similar data for complete timbering in place at the same mine are shown below.

These figures indicate that the treatment adds about one-third to the first cost of the timber in place. The cost of the treated timber per year of service, however, is very much less than that of the untreated timber. If we take the \$2.89 and \$3.89 figures, for example, and assume an average life of two years untreated and 10 years treated, the annual charges, computed at 6 percent interest, become, respectively, \$1.58 and \$0.53. The untreated timber is in this case three times as expensive to use as the treated.

At another mine, also in the Ruhr, the detailed costs of treating a group of pine mine timbers (8,483 cubic feet) in April, 1926, were as follows:

Preservative	\$426.00
Water .....	.24
Steam	30.72
Compressed air	4.44
Labor	57.36
	<hr/> \$518.76
Cost per cubic foot.....	\$0.061

These figures take no account of in-

terest on investment, deterioration of plant, or profit, all of which must be considered in commercial treating plant operation. Under average conditions, at the same mine the labor cost of installing timber underground was said to be about 24 cents for an 8 or 9-ft. prop. The average cost of installation was said to be about 23.8 to 27.2 cents per cubic foot of timber. The treating and installation costs are bound to vary considerably at different mines because of differences in mining conditions and methods and differences in treating practice.

The evidence available at the mines and in railway tracks and pole lines showed Basilit and the Wolman salts Minolith and Triolith are very effective in preventing decay, and that great savings in permanent timbering costs in mines will result from their intelligent use. It was not possible, however, to determine how these three preservatives compare in effectiveness with each other or with the preservatives in common use in the United States. No two of them have been used in such a way that their service results can be fairly compared. In one service test, started in 1914, comparison might have been possible between two of them (Minolith and Basilit), had not the experiment been discontinued.

In view of the showing made by Minolith, Basilit, and Triolith in Europe and by creosote, zinc chloride, and sodium fluoride in the United States, it is clearly evident that any one of them may be chosen with complete assurance that its intelligent use will save much timber and money and prove very economical.

COST OF COMPLETE TIMBER INSTALLATION, INCLUDING TIMBERS AND LAGGING				
Wood complete for a drift length of Feet	Area of drift cross section Square Feet	Cost of untreated wood in place Dollars	Cost of treating the wood Dollars	Cost of treated wood in place Dollars
4	89.3	\$2.67	\$0.93	\$3.60
5	89.3	2.89	1.00	3.89
4	107.6	2.93	1.01	3.94
5	107.6	3.16	1.09	4.25

STANDARDIZATION PROGRAM OF PETROLEUM INSTITUTE

The Institute's Program Of Standardization Of Oil Field Drilling Equipment Is One Of Great Merit—They Have Obtained Results Commensurate With Their Efforts And Are Performing A Real Service To The Industry

By C. A. YOUNG*

THE study of the arts and sciences connected with the petroleum industry and the promotion of the mutual improvement of its members are included in the objects of the American Petroleum Institute as expressed in its charter. The institute's program on the standardization of oil-field drilling equipment may be properly classified under that heading.

The American Petroleum Institute is an outgrowth of the Petroleum War Service Committee appointed by the President during the late war. It is essentially a national organization, and all branches of the petroleum industry are represented on its board of directors. Its first annual meeting was held in Washington, D. C., in 1920, and at that time the first conference on standardiza-

* Director, Division of Standardization, American Petroleum Institute.

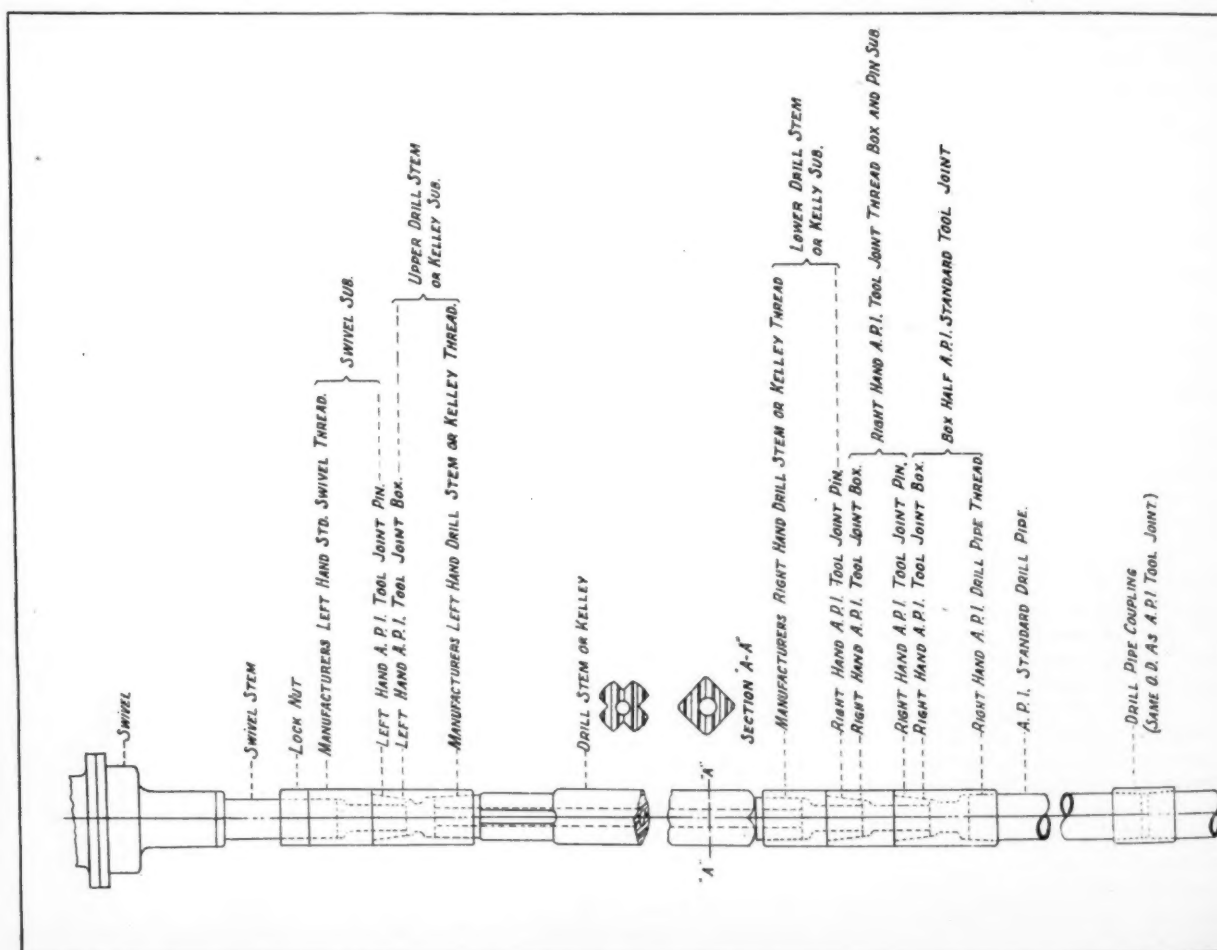
tion was held, attended by representatives of three of the larger manufacturers of equipment. Standardization has been an integral part of the institute's activities ever since, until today over 400 executives, engineers, and practical field men are voluntarily serving on its various standardization committees.

Progress in the early stages was slow. The question was discussed from all angles at several of the annual meetings of the institute. Speakers were invited to explain what had been accomplished in other industries and the plans under which they operated. As a result of these investigations and conferences, a resolution was adopted by the board of directors in 1922, declaring it to be the policy of the institute to encourage and

bring about standardization and simplification of oil-drilling equipment and methods where desirable and practicable and that such committees of the oil industry be appointed as were advisable to carry on the work. Several committees were appointed at that time on various subjects. Meetings were held and specifications drafted. As progress was made, the need for a special division in the institute to head the work became apparent, and in 1924 it was decided to create a division of standardization when a definite plan of procedure and method of work was agreed upon.

Each special A. P. I. committee on standardization is composed of six district committees, including a committee of manufacturers, as follows:

Eastern District, composed of Pennsylvania, Ohio, Indiana, West Virginia, and Kentucky.



Mid-Continent District, composed of Oklahoma and Kansas.

Louisiana—Arkansas District.

Rocky Mountain District, composed of Wyoming and Montana.

Texas District.

California District.

Manufacturers' Subcommittees, composed of manufacturers.

There was a distinct purpose in appointing district committees.

Oil is usually found in pools. These pools are widely scattered over the United States. As a matter of course, each section gradually evolved sizes of equipment, joints, threads, etc., peculiar to that section. This resulted in many distinct types, and in many cases equipment became known as "California Special," "Texas Type," etc.

Before standardization in a national way could be effected, it was necessary to reconcile and harmonize the views from the various districts, hence the need for committees in each district. These committees meet from time to time and make recommendations on standards suitable for their districts. Twice a year general sessions are held of all the various district committees, including the

manufacturers, when these district recommendations are reviewed and correlated.

There are two distinct systems of drilling, one known as the rotary method and the other as the cable tool method. The former is necessary when drilling in loose or caving formations, and the latter is commonly used in harder formations.

In the rotary method the hole is made by the cutting action of a fishtail or roller type bit rotated at the bottom of a column of hollow drill pipe, through which the mud-laden fluid is forced downward by means of pumps, the cuttings being continuously washed away from the bit end, and carried to the surface with the mud-laden fluid on the outside of the drill pipe. (See Figure 1.) By this process the wall of the hole is sealed with a layer of mud of clayey consistency, which tends to prevent caving. Upon withdrawal of the drill stem, the casing can be lowered and set through the mud-laden fluid in a single continuous operation when a desired depth is reached. This method of drilling involves the repeated removal of the drill pipe from the hole for the purpose of changing the cutting bit, which sub-

jects the derrick, wire rope, hoisting apparatus, and threads on the joints and pipe to continuous and heavy duty. The discovery of the Spindletop Field, in Texas, in 1901 introduced the rotary system of drilling as the cable tool method was inadequate to handle the peculiar formations found there. As various other pools were discovered in Texas the use of the rotary method was greatly extended and, with the introduction of the roller type bits for rock formations, soon found favor in other producing districts of the United States, until today possibly 60 to 70 percent of the drilling done in this country is by that method.

In cable tool drilling, a string of tools, connected to a wire line and attached to the walking beam by means of a temper screw, is raised and dropped at regular intervals, the hole being made by the

Note No. 1. Union Tool Co. practice $\frac{1}{8}$ " larger than pipe O. D. on sizes 3" and over. $1/16$ " larger sizes under 3".

Note No. 2. Practice of making this diameter from $\frac{1}{4}$ " to $\frac{1}{2}$ " larger than O. D. of tool joint depending on size of drill collar, becoming more general.

Note No. 3. Satisfactory for 8" drill pipe string which will have 7" x 8"-4 boxes and pins, "Y" type thread, 3" taper per foot and will also be satisfactory on 6" drill pipe string if a "Y" type tool joint thread with 3" taper is adopted which has a taper suitable for a fishtail tool joint. For example, if the present 5" x 6-4" "Y" type tool joint thread with 3" taper is adopted as the A. I. standard for 6" tool joints it could also be used on lower drill collar box and pin on bit. On 5" and smaller drilling strings the lower drill collar box and the pin on bit depends on adaptability of tool joint threads adopted.

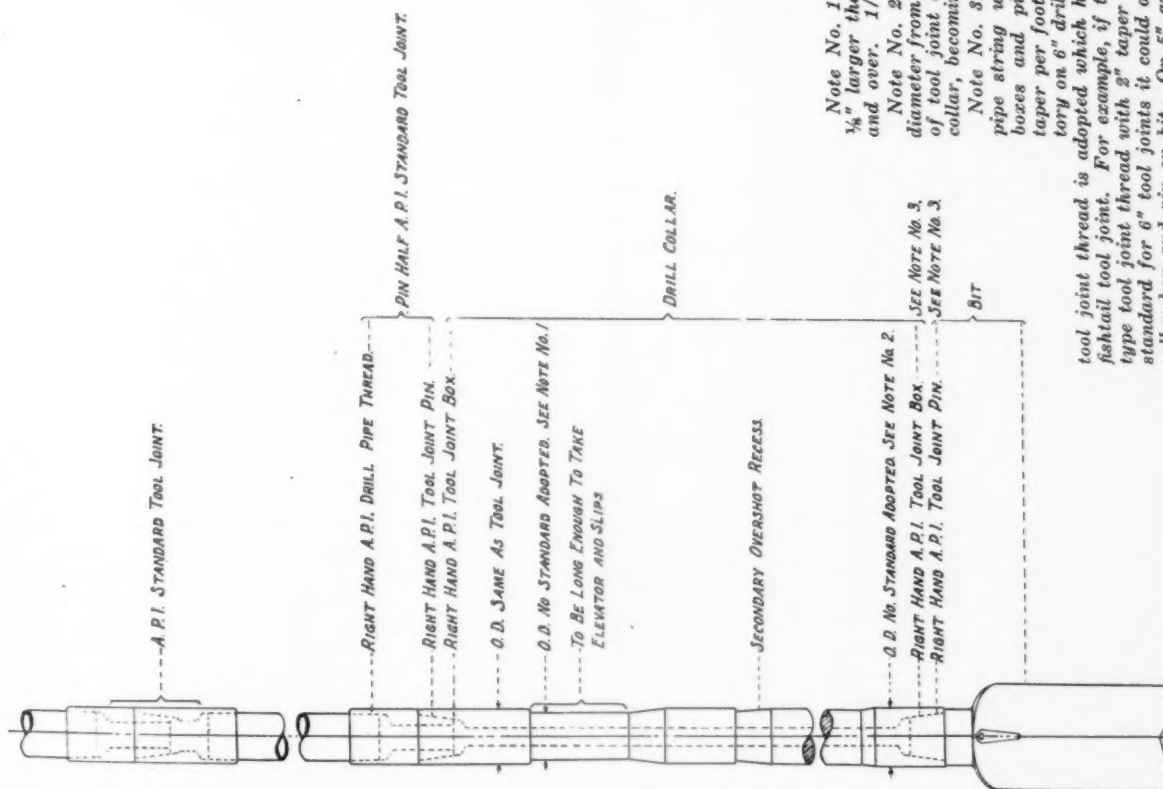


Fig. 1. Rotary System.

pounding action and the consequent shattering of the materials encountered. (See Figure 2.) The casing is kept free and lowered as the hole is made. The cuttings are removed periodically by bailing, which necessitates the removal of the drilling string. This method is generally used where continuous hard formations are encountered, such as obtain in Pennsylvania, West Virginia, Wyoming, and certain parts of Oklahoma and Texas.

However, the equipment used in either method is essentially alike, the only differences between the various districts are the sizes of threads used for taper joints, connections, different types and heights of the derricks, and different combinations of pipe, etc. For example, in the cable tool method a certain size of taper joint came into general use in the Mid-Continent and Eastern fields known as the I&H. This joint was made by all manufacturers, and a certain degree of interchangeability was had through the voluntary cooperation of the manufacturers, although no national standards had been formulated or definite types of gages adopted. California had developed a different type of joint, known as the H&T. Due to the preponderance in use of the I&H joint throughout the Eastern and Mid-Continent Districts and the diminishing use of cable tools in California, the California committee agreed to change their joints to the I&H type which had been adopted as the A. P. I. standard. Precise dimensions on gages have been adopted and a set of grand master gages deposited with the Bureau of Standards in Washington, D. C. To facilitate the checking of gages owned by the manufacturers and operators in the various districts, the institute also owns and controls three sets of reference grand master gages; one set deposited in Pittsburgh, Pa., one in Bartlesville, Okla., and one in Los Angeles, Calif. This enables the manufacturers to check their gages from time to time and maintain them to standard. Figure 3 illustrates a typical taper joint gage.

A somewhat similar condition obtained in the rotary method of drilling, in which taper joints are also used. There was no generally accepted standard in use on rotary taper joints except in the larger sizes. Due to the difficult drilling conditions in California, they developed there a special size and taper for heavy work which rapidly gained in favor in the other districts. In the smaller sizes of joints, however, a different condition prevailed. Each district had special sizes and types. For example, in one district in Texas 24 different sizes and types of taper joints were being used in connection with 4-in. drill pipe. Exhaustive tests were made by the committee on different sizes and styles of threads. Over \$50,000 was spent

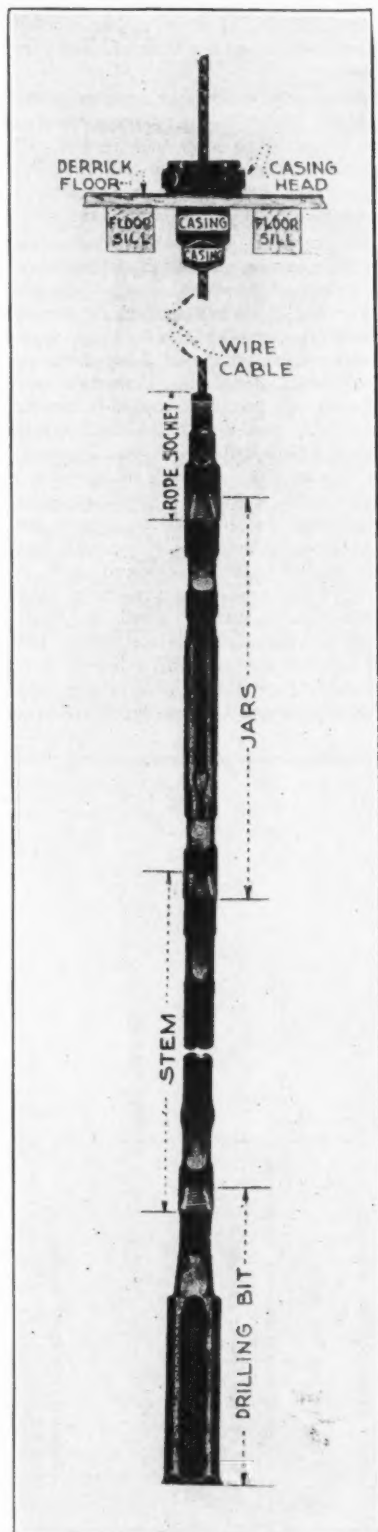


Fig. 2. Cable Tool System

in experimental test work alone. As a result of these investigations and tests, the committee has finally agreed upon a definite thread, size and taper for each

size of drill pipe used. This specification has just been completed. Definite sizes of gages have been adopted and grand master and reference grand master gages will be owned by the institute, similar to the manner described for cable drilling tool joints. This will mean that eventually the various tools threaded with A. P. I. standard joints can be transferred between the various districts. It should be of great assistance to the manufacturers in their stocks, as well as to the large producers of oil who operate in several districts.

Pipe represents the largest single item of material expense in the drilling of an oil well. Several strings of casing are required before the ultimate depth desired is reached. A situation similar to taper joints previously described also prevailed on pipe, especially on threads and sizes. Certain sizes of threads had been adopted for one district different from those used in another. For example, the California fields used 10-thread to a great extent on casing, whereas 8-thread was commonly used in Texas on similar sizes of pipe. The committee on tubular goods has adopted a table of sizes and threads which it is hoped is comprehensive enough to answer the needs of all producing districts. Definite dimensions on gages have been specified, and what is equally important, a definite gaging practice has been adopted.

Drilling for oil is often done in isolated localities, in many cases long distances from the centers of supply. It is frequently necessary for an operator to match up pipe from different manufacturers, and often the pipe of one manufacturer, presumably of the same size and thread, did not properly interchange with similar pipe of another manufacturer. It is expected that this condition will be remedied by the use of the A. P. I. specifications, since pipe so made up should be safely interchanged. Definite standards have also been adopted for drill pipe used for rotary drilling and for tubing through which the oil is produced. Specifications on line pipe are now under consideration.

Tentative specifications have been adopted on belting, of which large quantities are used in the drilling for and producing of oil. Tests are now being conducted on elasticity and fatigue of belting. Belt clamps are receiving special consideration. The specification covers all types and classes of belting now generally used in the oil fields, such as rubber, balata, solid woven cotton, leather, etc.

The A. S. M. E. boiler code has been adopted as standard for oil-field boilers. In addition the committee has adopted specific sizes, a standard method of rating horsepower, as well as standard openings and fittings.

Standard sizes of derricks have been

adopted. A canvass by the committee revealed that over 300 styles and types of derricks were in general use. This number has been reduced to 11. The specification includes uniform dimensions on openings through the derrick top, as well as on heights and bases, a code for computing the strength of derricks and measurements on principal rig parts used in connection with derricks, such as the bull and calf wheel, the band wheel, etc.

Complete specifications have been adopted for rig irons, which are integral parts of the drilling rig. These specifications are purely dimensional and provide for interchangeability of the principal working parts.

One of the important accomplishments is the adoption of standards on shafting, keys, chains, and sprocket-tooth form. The sizes of shafting and keys were selected from the national standards promulgated under American Engineering Standards Committee procedure and sponsored by the A. S. M. E. Specific dimensions for the chain pitch, diameter and length of roller have been adopted, as well as a sprocket-tooth form to be used therewith.

Tentative specifications have been adopted on wire rope and manila cordage, of which large quantities are used in the oil industry, particularly wire rope, which is especially important in both the rotary and cable tool methods, although the requirements in the two methods are vastly different. In the cable tool system the wire rope is subjected to continuous and sudden shocks and strains. When it is realized that holes are drilled many thousand feet in depth, often in excess of 5,000 feet, the strains imposed on wire rope are apparent. The service required of wire rope in the rotary method is essentially hoisting, involving severe crushing strains when wound on the drum, and the continually increasing speed and weights used have created increasingly difficult problems. It is possibly a fair statement to make that there is no other industry where wire rope is subjected to as severe strains as in the oil industry. In addition to formulating specifications on the rope, the committee has also made specific and valuable recommendations on the care and use of rope in the field. A specific form of groove has been approved for sheaves and rope pulleys.

The finding of oil at ever-increasing depths and the necessity of pumping such oil has created many specific problems. A definite specification on the sizes of threaded joints has been adopted for sucker rods, as well as the working barrels or pumps. A uniform method for rating the horsepower of single cylinder horizontal type internal combustion engines has been formulated.

Definite specifications are now being prepared on steel tanks used for oil stor-

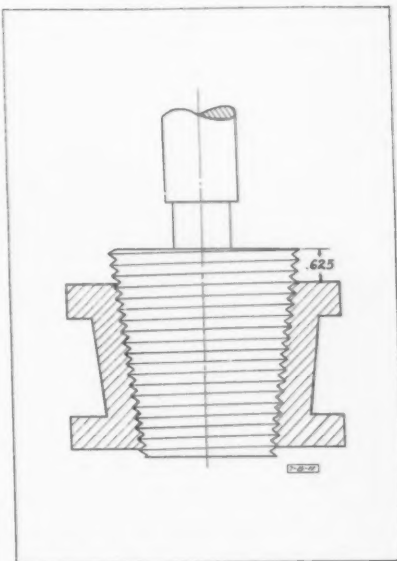


Fig. 3. Taper Joint Gage

age. These have been divided into two classes: Large riveted storage tanks, ranging in capacity from 10,000 to 80,000 barrels, and the smaller bolted production tanks ranging in capacity from 250 to 10,000 barrels.

The institute has adopted a special monogram for identifying its official publications on standards, as well as for stamping such products as are manufactured in accordance with its standards, as follows:



Authority will be granted upon request to any manufacturer to use this monogram. Its use should be of special assistance in the field, as it provides quick identification, especially on threaded connections and tapered joints.

The institute has issued a handbook on standards, in a convenient pocket size, somewhat similar to the one issued by the American Mining Congress. Ten specifications have been completed to date, and four more are in the course of printing.

Over fifteen hundred handbooks have been sold to date since its announcement in October, 1926.

A. P. I. standards are rapidly coming into use. Several hundred thousand dollars have already been expended by the various manufacturers for gages alone. Advertisements are regularly appearing in the oil trade periodicals advising the public that material is available to A. P. I. specifications, which indicates an active support of our program.

In addition to formulating standards, the committees are now engaged in pre-

paring codes on recommended field practice for each of the subjects under consideration. Many of the specifications already contain partial recommendations on field practice. It is hoped to eventually publish a complete handbook of standards and recommended field practice for all the major items of equipment used in the drilling and producing of petroleum.

One of the outstanding features of our standardization program has been the broad spirit of cooperation that has existed in all of the work. Concessions from both the consumers and the manufacturers have been necessary and freely given. It has, also, served to develop the growing consciousness within the oil industry of its responsibility, not only to itself but to the public, to produce petroleum and its products as economically as possible, and is in line, we believe, with similar efforts in other industries.

POLLUTION OF WATERS BY OIL WASTES

A STUDY of methods and devices for handling oil-contaminated water from ships and industrial plants has been made by the Bureau of Mines, in cooperation with the American Petroleum Institute and the American Steamship Owners' Association.

In general, the petroleum oils which give the greatest trouble are the heavier products, such as bunker fuels and the asphalt-like residues often encountered. The more volatile constituents, like gasoline, kerosene, and naphtha, evaporate quite readily and are not commonly associated with the term "oil pollution."

Methods proposed for the solution of the oil-pollution problem in navigable waters comprise two general classes—those designed to dispose of oil-contaminated water and other oil wastes by the use of facilities provided on land or in port, and those designed for use on ships.

Land plants, in general, are handling the problem of oil-waste disposal with some measure of success. The petroleum industry, primarily as a measure to prevent industrial waste, has devised and applied means for largely eliminating pollution by oil from refineries. Certain other land industries, including ship-repair yards and particularly gas-manufacturing plants, have also adopted measures that reduce the amount of oil escaping into the water.

The findings of the committee are outlined fully in Technical Paper 385, by F. W. Lane, A. D. Bauer, H. F. Fisher and P. N. Harding, copies of which may be obtained from the Bureau of Mines, Department of Commerce, Washington, D. C.



Courtesy The Explosives Engineer

In the heart of the district designated by Congress as the Great Smoky Mountains National Park

FEDERAL DOMINATION VS. STATE SOVEREIGNTY

We Must Look To Regulations, Whatever They May Be, For The Real Law In Connection With Any Question Concerning The Public Domain—Water Power Act And Leasing Bill Simply Steps Forward In A Program For Eventual Government Control Of All Natural Resources

*By CHAS. L. GILMORE**

IN ADDITION to the national forests, there are in the Western States several national parks. The former are administered by the Department of Agriculture and the latter by the Department of the Interior. At least, it is the supposition that the national parks are under the jurisdiction of the Interior Department, and, as far as the statute of Congress is concerned, they are. But as is the case in all Federal Government affairs, the actual, literal control is vested in some other official. In the case of national parks, this vast domain is subject to the rule of one man, the Director of the National Park Service. The term is really misleading, because he is not merely the director at all. He is the "dictator." In all that area one man exercises the same degree of authority over the person of the visitor and over the land and all other resources, natural and artificial within those parks, as the Czar of all the Russias exercised in that unfortunate country prior to the World War. The dictator enacts all laws for the government of all things, human

and otherwise, within the parks. He grants exclusive rights to persons and corporations to conduct business therein and has the absolute right to revoke any license or permit at will. He has the right to create a law today, repeal it tomorrow and enact a new one in its place. Those regulations have all the force and effect of a statute of Congress, and if you violate any one of them you go to prison for such term as the judge sitting feels necessary.

The foregoing is merely a résumé of one appointed individual.

That you may learn of the power of this dictator I quote here one section of the act of Congress relating to the national park system, approved August 25, 1916:

"SEC. 3. That the Secretary of the Interior shall make and publish such rules and regulations as he may deem necessary or proper for the use and management of the parks, monuments, and reservations under the jurisdiction of the National Park Service, and any violations of any of the rules and regulations authorized by this act shall be punished as

provided for in section 50 of the act entitled 'An act to modify and amend the penal laws of the United States,' approved March 4, 1909, as amended by section 6 of the act of June 25, 1910 (36th U. S. Stats. at L., p. 857). He may also, upon terms and conditions to be fixed by him, sell or dispose of timber in those cases where, in his judgment, the cutting of such timber is required in order to control the attacks of insects or diseases or otherwise conserve the scenery or the natural or historic objects in any park, monument, or reservation. He may also provide, in his discretion, for the destruction of such animals and of such plant life as may be detrimental to the use of any of said parks, monuments, or reservations. He may also grant privileges, leases, and permits for the use of land for the accommodation of visitors in the various parks, monuments, or other reservations herein provided for, but for periods not exceeding 20 years; and no natural curiosities, wonders, or objects of interests shall be leased, rented, or granted to anyone on such terms as to interfere with free access to them by the public: *Provided, however,* That the Secretary of the Interior may, under such rules and regulations and on such terms as he may prescribe, grant the privilege to graze stock within any national park, monument, or reservation herein referred to, when, in his judgment, such use is

*Attorney at law, Sacramento, Calif.

not detrimental to the primary purpose for which such park, monument, or reservation was created, except that this provision shall not apply to the Yellowstone National Park."

I will pit the above statute against any grant of power existing in any law in any country. But why the exception in that statute in favor of Yellowstone National Park? Are not all laws of similar character supposed to be uniform in their operation? Why should one park be granted privileges and immunities not enjoyed by all others?

BEYOND THE LAW

The laws of the sovereign state wherein one or more of these national parks exist might as well be repealed as far as their effectiveness within the sacred boundaries of the parks is concerned. The only law within those hallowed precincts is the law of the dictator, backed by a troop of cavalry.

That this power is practically without limit may readily be proven by a careful reading of the above-quoted section of the law. That the laws of the particular state wherein such a park is located may be brushed aside at the will of the director may likewise be proven by a careful reading.

The sovereign State of California spends many thousands of dollars annually spawning, rearing and distributing fish to the streams and lakes within national forests and national parks. This expense is borne wholly and entirely by those who hunt and fish and the Federal Government contributes not one cent either directly or indirectly toward defraying the expense. When those fish are placed in any of the national parks in California, the fish and game laws of the state no longer apply.

REPEALING THE CONSTITUTION

Although the second amendment to the Constitution expressly grants to the people the right to keep and bear arms, this rule does not apply within national parks. When you approach the boundary, you must either give up your gun altogether or allow it to be sealed during your whole stay in the park. It is argued that this regulation is essential so that game within the park boundaries may have full and complete protection; but one man has the absolute right to destroy all animals in any national park, as the law above clearly states. The United States Supreme Court has, for more than 100 years, reiterated that the game within a state belongs to the people thereof in their sovereign capacity, and that they have the unquestioned right to legislate in any manner they may see fit concerning it, even to the right of prohibiting the taking altogether.

The total disregard for constitutional limitations is most clearly depicted in

the matter of national parks. In those cases not only is there a complete disavowal of the Constitution in withdrawing the lands of a sovereign state and refusing to dispose of them, but there are the two other very important factors, viz, delegation of legislative powers by Congress to one man, carrying with it the right to create criminal statutes at will, and arrogant overriding of the right of the state to legislate concerning property within its own borders, including the right to tax.

POWER-SITE WITHDRAWALS

On June 25, 1910, the President of the United States approved what is commonly known as the "power site act." This act of Congress authorizes the President of the United States to withdraw from all forms of disposal any land he may determine to have value for power development. These lands are additional to forest reserves and national parks, and the act does not apply to lands withdrawn for park purposes. The power site act withdraws all lands within miles of a running stream, and was the first step of the Federal Government toward taking over the water of the several states. The Federal Government holds the land absolutely, and grants, in the form of a license, the right to develop the water power to any person or corporation that has the capital to go into the business of electrical development. For the license the Federal Government exacts a fee based upon the electrical energy developed and retains the whole sum collected. The state does not profit one cent in the transaction.

This act confers no benefit whatever on the state and is purely a source of revenue to the Federal Government. In this case the state is denied the right of use of its own lands, is denied the right to tax them, and obtains nothing whatever in return.

WATER POWER ACT

Following out the intent of the power site act, Congress enacted the act of February 20, 1920, otherwise known as the "Federal water power act." This act is an admirable illustration of the lengths to which Congress will obediently go in giving away the rights of the sovereign states to some Federal board or bureau.

Ever since the first question involving water rights was decided by the Supreme Court, that body has held to the uniform rule that the water either underground or flowing in the streams within a state belonged to the people thereof, and that they had the unquestioned right to legislate as they saw fit concerning it. The only concern the United States Government ever had or now has with water is that flowing in navigable streams and that begins and ends with navigation. It has never been conceded, nor can it constitutionally be conceded that the

Federal Government has any right or rights in any water in any innavigable streams. But in line with the continual usurpation of the sovereign rights of the states under laws enacted by a Congress that seemingly is under the thumbs of the hosts of boards, bureaus and commissions that swarm through the National Capital, that Congress obediently enacted a law that violates every canon of constitutional law.

OIL LAND WITHDRAWAL

We now approach the act of Congress approved February 25, 1920, which gave the Federal Government the control of all oil, gas, phosphates, sodium, and oil shale deposits that had not been disposed of prior to the time Congress decided to increase the Federal jobs. Under this act the President has the right to withdraw from sale or disposal any lands that he may believe contain oil, gas, coal, phosphates, sodium or oil shale. The following is taken from the act:

"That the Secretary of the Interior is authorized to prescribe necessary and proper rules and regulations and to do any and all things necessary to carry out and accomplish the purpose of this act, and also to fix and determine the boundary lines of any structure, or oil or gas field, for the purposes of this act."

And so the act itself has been consigned to the wastebasket, as is the case with all other acts of Congress relating to the public domain, and we must look to the regulations, wherever they may be, for the real law. I defy anyone, Supreme Court justices not excepted, to obtain title in fee or under a lease under any public-land statute of Congress. The law has been entirely superseded by regulations.

TEAPOT DOME

Some time ago the Department of the Interior, under the statute above referred to, undertook to administer certain oil deposits in Wyoming according to the latest improved standards of Government regulation and ownership. The people were to be shown exactly how an oil field should be developed so that the United States Treasury would obtain the income and not some grasping corporation. The details of this ghastly failure and the actual events that transpired are known throughout the United States. But there was a case where the "Secretary of the Interior" had full and complete power "to make all necessary rules and regulations" to make the operation and control of the oil deposit effective.

Teapot Dome was and is merely one instance of the thousands of instances of Federal inefficiency in administering the natural resources of the sovereign states. The public generally heard of it because it concerned oil. The public generally does not hear of the daily failures of the Government in the management and control of other natural

resources. That public does not know that fire from natural causes is destroying the standing timber in the West more rapidly than all the lumbering concerns put together. The short-sighted policy of the Forest Service is permitting the rapid destruction of our standing timber through fire and insect ravages to such an extent that within 30 years, at the present rate of destruction, there will be no merchantable timber in the West save that in private ownership. But the public does not hear of these things because timber is not such a basis for sudden and spectacular wealth as oil.

The admitted failure of the Government to cope with the oil situation and the continuing failure of that Government to administer our forests profitably and with an eye to future production is certainly sufficient to show that the Federal Government can not develop nor control the natural resources of the states. The Federal Government fails because the basic law of the land is against it and because a government such as ours is not a business or commercial corporation.

WHY STOP WITH OIL?

Why the Congress stopped with the deposits of minerals named in the oil land withdrawal act is beyond me. Oil is only one mineral and there are many others. Why not step in and take over the gold, silver, copper, zinc, lead and other valuable minerals? Perhaps it will do so whenever the boards and commissions can agree as to who shall handle the job. Some Federal board is overlooking its hand. There would be a nice series of jobs and considerable money operating some of the western gold, silver, lead, copper or zinc mines. The western country was constructed and the whole United States financed by the discovery of gold, first in California and later in the other Western States. California was admitted as a free state, and it was the gold her mountains and streams yielded that furnished the money to the Union for the Civil War. When those hardy pioneers swept across the continent into California's gold fields they not only developed the country but they developed an empire, all without cost to the Federal Government. Their heirs and successors in interest have continued the development and continued the steady stream of gold, notwithstanding the most inane lot of mining laws and the worst red-tape bound mess of regulations that ever beset any industry in the history of the world. It would be strictly in line with Federal policy for some board in Washington to intercede and take over those mines and operate them.

If the Federal Government has the constitutional right to take over one

mineral, it has the right to take over all minerals. If it has the right to assume control by actual ownership of the mining industry, then it can assume ownership of the fruit industry, the automobile industry, the building industry, or any other business.

WORKING ON 66 2/3 PERCENT

The various withdrawn lands included in forest reserves, national parks, national monuments, power site, oil, coal, and other withdrawals include approximately one-third the total land area of the State of California. Thus two-thirds of the area of this state must support the whole. One-third is dead and may as well be incorporated into another state for all the good it does California. In fact, it is, to all intents and for all purposes, within another state, because the state has little, if any, jurisdiction over that area. Yet the Constitution expressly provides that no new state shall be formed within the confines of any existing state without consent of that state. However, the little factor of first obtaining the consent of the state never entered the heads of the individuals that go to make up a Congress of the United States.

MIGRATORY BIRD TREATY ACT

Ever since the question was first raised, and down to 1920, the Supreme Court uniformly held that the fish and game within a state belonged to the people thereof in their sovereign capacity, and they had the right to legislate as they saw fit concerning them as long as the laws were uniform in operation.

But on July 3, 1918, the President approved the "Federal migratory bird treaty act," whereby the powers-that-be in Washington assumed jurisdiction over all wild game birds that might be classed as migratory. Again, as in the past history of domestic legislation, Congress labored and brought forth a meaningless jumble of words. In section 3 of the act Congress turned the whole business over to the Secretary of Agriculture and authorized him to allow the killing or prohibit the killing of any birds named in the act, and "to make all necessary rules and regulations." So the Secretary of Agriculture, in turn, passed the buck to the Bureau of Biological Survey, and one man now runs the whole works.

Instead of the people of the state having the right to legislate concerning their game birds, we now have that power transferred to one subordinate officer of a cabinet bureau. Would you deem this government of the people, by the people, and for the people?

ONE GAME WARDEN

In California there are about 250,000 licensed hunters. The state is equal in area to the States of Maine, New Hampshire, Vermont, Massachusetts, Rhode

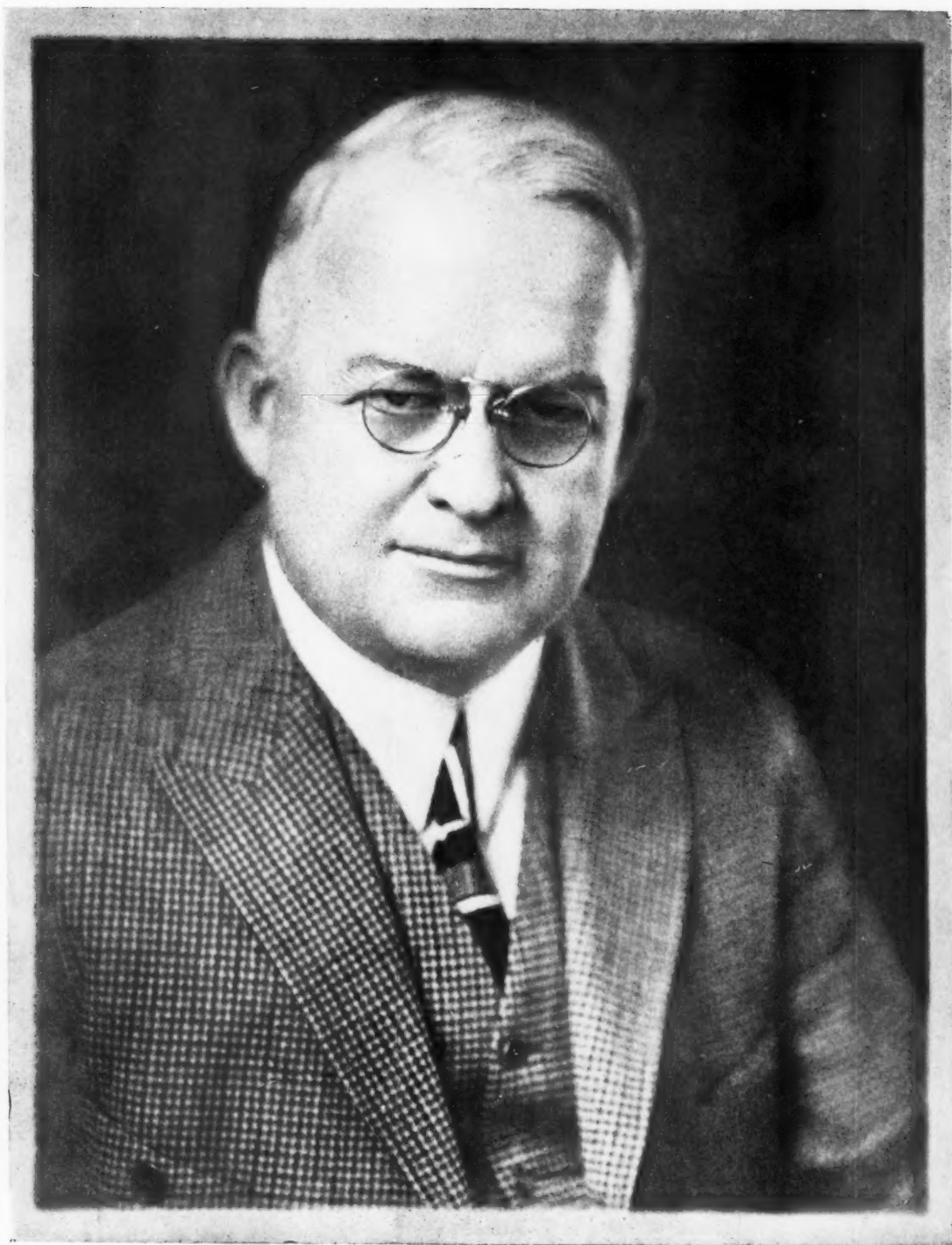
Island, Connecticut, New York and Delaware, with a thousand square miles extra for good measurement. Migratory birds are not confined to any one particular section of the state but range the whole area. Even sea-gulls are common sights at Lake Tahoe, 6,300 feet above sea level. To patrol this vast area the United States Government furnishes one man! Congress, obedient to the crack of the whip of a Washington bureau, enacted the law, and then refuses to give the birds even passing protection. Even a Congressman should realize that it is impossible for one man to cover a state the size of California. Why should the Federal Government assume jurisdiction and control over matters of state sovereignty and then do absolutely nothing to afford protection?

TRY THIS ON YOUR STATE

Eastern people may not appreciate the refusal of the Federal Government to dispose of the land. Take one of the Eastern States, for example, and carefully divide it into three equal parts in any manner you see fit. Then eliminate one of the thirds altogether. Get in touch with the authorities who have to do with that state's finances and ask whether the state as a whole will suffer in any manner through the loss of that taxable area. Now appeal to the Supreme Court of the United States with a prayer that the Federal Government be stopped from taking that third of the state's area away and have that body decide that it was a perfectly legal and eminently fair and equitable act that eliminated that third from the control and taxing power of the state.

The foregoing does sound rather far-fetched and impossible, but that is what happened to the sovereign State of California. We who live in California are supposed to throw our respective hats high in air and give three rousing cheers for the privilege of being deprived of one-third our taxing power.

Now, don't get the idea that it is impossible to mutilate that state in the manner you have just done. It is a perfectly legal act for Congress. I refer you to the case of *Coyle vs. Smith*, in volume 221 of United States Reports, at page 559. Please note that the Supreme Court said that each state came into the Union on terms of absolute equality with all the rest, and that "this Union is a Union of States, equal in power, dignity and authority and each competent to exert that residuum of sovereignty not delegated to the United States by the Constitution itself." So what has been done in California, can be done in New York or Pennsylvania. Nothing is impossible for a meddling Congress blind to every idea of sovereignty of the states.



Harris & Ewing

Wm. H. Lindsey, Recently Elected President, The American Mining Congress

INDUSTRIAL DEVELOPMENT CONFERENCE

Second Annual Meeting Southern Division American Mining Congress—Inspection Tour Follows Two-Day Meeting—Banking And Finance, Tax Reduction, Water-Power Development And Opposition To Government Control Of Industry Featured In Addresses

MEETING for the second time, the Southern Division of the American Mining Congress at Birmingham, Ala., March 21-22, strikingly focused attention on its latent mineral resources and increased the interest of capital in possibilities for their early development. This Industrial Development Conference, which was projected a year ago at Memphis, Tenn., showed that during its brief history it had accomplished results. The Birmingham meeting was seized upon by the South as an opportunity of extending increased recognition to and support of the American Mining Congress in the ambitious program it has launched for the realization of a great southern mineral empire. In point of attendance, interest, type of speakers, and the wealth of material developed in the deliberations of the conference, the Birmingham meeting outranked that held a year ago. Official delegates appointed by governors of all of the southern states supplemented individual groups from various parts of the country, the whole comprising representatives of various lines of business having contact with mines. Ten trunk-line railroads, the Tennessee Coal, Iron & Railroad Co., and the Alabama Power Co. were represented by delegates. The Governor of Alabama, Hon. Bibb Graves, welcomed the conference at the opening session; another governor, Dennis Murphree, of Mississippi, accompanied the delegates on their tour of inspection of industries of Mississippi during the last three days of the week; and his predecessor, Henry L. Whitfield, had issued an official proclamation a few days before his death, which preceded the conference, extending congratulations to the American Mining Congress for its program of developing southern mineral resources. Congress was represented at the conference by Representative M. C. Allgood, of Alabama; the federal government by Dr. E. F. Burchard, of the United States Geological Survey; and the southern states were officially represented by their state geologists, who addressed the convention on the mineral resources of their commonwealths and the possibilities for their productive development.

The conference was the first official organization to be presided over by the new president of the American Mining Congress, William H. Lindsey, of Nashville, Tenn., who has signalized his assumption of this office by a determina-

tion to actively promote the full development of the Southern Division, of which he was the first chairman of its board of governors.

Full credit for awakening the South to a recognition of its mineral resources was given by Richard H. Edmonds, editor of the *Manufacturers Record*, of Baltimore, to the American Mining Congress.

OFFICERS ELECTED

R. G. Brown, of Louisville, Miss., was chosen as the new chairman of the board of governors of the Southern Division at the concluding session on Tuesday, March 22. Other new members elected to the board of governors were:

J. H. Hand, of Yellville, Ark.; Dr. A. V. Henry, of Atlanta, Ga.; J. E. Johnson, of Lexington, Ky.; W. H. Sullivan, of Bogalusa, La.; and J. H. Little, of Waco, Tex. The following members of the board were reelected: C. G. Memminger, of Mulberry, Fla.; Dr. A. F. Greaves-Walker, of Raleigh, N. C.; E. L. Hertzog, of Spartanburg, S. C.; Howard I. Young, of Mascot, Tenn.; and Charles W. Johnston, of West Norfolk, Va.

The sessions were held in the ballroom of the Tutwiler Hotel and were opened on Monday morning, March 21, at 9.30 o'clock, by L. J. Folse, of Jackson, Miss. Invocation was delivered by the Rev. Dr. Henry M. Edmonds, of the Independent Presbyterian Church. Governor Graves, in his welcoming address, expressed his pleasure and that of Alabama and the South that the conference had again gathered in its midst.

Governor Graves, who was introduced by James L. Davidson, secretary of the Alabama Mining Institute, expressed his faith in the South and its industrial development.

The governor was thanked for his gracious reception by J. F. Callbreath, of Washington, D. C., secretary of the American Mining Congress, who spoke of the varied activities of the American Mining Congress in behalf of the full development of the mining industry.

The convention heard five-minute addresses on the resources of their states by the following state geologists or their representatives:

Dr. Eugene A. Smith, of Alabama; Dr. George C. Branner, of Arkansas; Herman Gunter, of Florida; Dr. S. W. McCallie, of Georgia; J. E. Johnson, coal operator, of Lexington, Ky.; William F. Chisholm, director of the Bureau of Mineral Resources of the Department

of Conservation of Louisiana; Dr. E. N. Lowe, of Mississippi; H. J. Bryson, acting state geologist of North Carolina; Walter F. Pond, of Tennessee; J. H. Little, of the Waco, Tex., Chamber of Commerce; and Dr. Wilbur A. Nelson, of Virginia.

MINING CONGRESS PRAISED

Rapid advances in the southern cement industry, interest in the development of which was initiated and fostered by the American Mining Congress, was referred to by Richard H. Edmonds, editor of the *Manufacturers Record* of Baltimore, Md., in a message to the conference. Mr. Edmonds stated that before the American Mining Congress conducted an industrial survey of the South a few years ago, it had been claimed that Florida could not produce Portland cement. He stated that its survey showed that there are great cement resources in Florida. "As a result of that specific work, one plant costing \$5,000,000 is nearing completion near Tampa, and another plant, to cost \$3,000,000, is to be built by cement makers of Pennsylvania."

Mr. Edmonds declared that the American Mining Congress is "heading a movement which can be made of limitless value to the mineral and industrial interests of the South and of the country," as the utilization of raw materials from Maryland to Texas is of great importance. He stated that the entire output of sulphur in the United States comes from the South and constitutes a large proportion of the world's production.

Mr. Edmonds said it is claimed that the clays of Georgia are of sufficient quantity to supply the country for centuries to come, and that the almost limitless quantities of lignite in Texas and Louisiana will furnish fuel in abundance and at low cost to industries of those states. Some Texas railroads are preparing to use powdered lignite as locomotive fuel, and a power plant in Texas is operated with lignite.

"Call the roll of all the minerals on which the world's industry is founded and but few of them will be missing from the South," said Mr. Edmonds.

Mr. Edmonds stated that to fully utilize southern natural resources it is essential that there be imposed a protective tariff high enough to safeguard the country against cheap labor of the Orient and Europe. He said a protective tariff is necessary "to safeguard American prosperity and American wages."



Map Illustrating Mr. Burchard's Address

Vice President W. L. Stanley, of the Seaboard Air Line Railway, being detained by official business, was unable to deliver his address, but the representatives of 10 trunk line railways made brief responses in behalf of their lines.

J. A. Emery, of the National Association of Manufacturers, spoke on "Industry and Community Development."

TAX REVISION

The afternoon session opened with a comprehensive address on tax revision and simplification of tax administration by McKinley W. Krieh, chief of the tax division of the American Mining Congress.

COAL AND WATER POWER

Addressing the conference on "The Partnership of Coal and Water Power," M. O. Leighton, consulting engineer of Washington, D. C., formerly chief hydrographer of the United States Geological Survey, said they were both essential to industry and commerce.

Mr. Leighton stated that hydroelectric power had increased the demand for fuel. "Coal has its assured place in our economic structure," he said. "It has enormous uses and applications that can not be displaced by hydroelectric power. Hydroelectric power has created additional uses for coal that far exceed the coal uses that were discontinued. Coal will only be displaced wherever hydroelectric power is superior. Hydroelectric power will not be used where coal is indispensable. Indispensable uses of coal are growing in number and capacity each year. Coal will not be sold where some-

thing else will do the work better and cheaper. All agencies that encourage and facilitate industry will create demand for fuel, and hydroelectric power is one of the most important of those agencies. There is small warrant for worry over the power market for coal. Even where water power is most abundant, steam power is very largely used, being tied with water power into the transmission and distribution system. In regions not having abundant water-power resources the steam-power installations are greater than those of water power."

Mr. Leighton said the coal industry was not justified in opposing water-power development, as such opposition would prevent development of the most promising markets for the coal industry.

SOUTHERN IRON ORE

An interesting address on the iron-ore situation in the South was presented by Mr. Burchard. He spoke of the types of ore in various southern states, including those of Birmingham, Chattanooga, Virginia, North Carolina, the western Tennessee Valley, southeastern Missouri, and northeastern Texas, and gave some interesting views on the duration of raw materials. As to the latter, he said:

"Among questions of importance to the American iron industry are those that concern the probable duration of supplies of ore, coal, and other raw materials. Inasmuch, however, as these conditions are subject to change and as the estimates of reserves are subject to considerable uncertainty, any estimate of

their duration is still more uncertain. Attempts to estimate the ore reserves in southern fields have been made in only the Birmingham, Chattanooga, and northeastern Texas districts, and I will only discuss those of the Birmingham district. For Minnesota and Michigan new estimates of iron-ore reserves by ranges are available every year, and in these states it appears that almost as much new ore is discovered as is mined each year, the estimated reserve being thus at nearly the same figure.

"The question how long the Birmingham district may continue to mine iron ore and coal and to make iron and steel is of interest not only locally but to the industry in the United States. The belief that it may prove to be the longest-lived iron-mining district in the United States is based on the very simple fact that as the ore is below the surface and has to be mined by underground methods and hauled out little by little through slopes, the production can never be as rapid as that in the Lake Superior district, where ore is dug on an enormous scale by hundreds of steam shovels and dumped directly into railroad cars within the open-pit mines. While the ore reserves in the two districts may amount to somewhere near the same quantity—possibly about 2,000,000,000 tons—the yearly output in the Birmingham district is only about 6,000,000 tons, while that in the Lake Superior district is about 60,000,000 tons, or ten times as great. At the present rate of production the iron-ore reserves of the Birmingham district should be expected to last about

333 years, while those of the Lake Superior district would appear to be limited to about 33 years."

MINE QUESTIONNAIRE

The results of a questionnaire submitted by the American Mining Congress to bankers, chambers of commerce, transportation companies, and industrialists in the South on economic needs of the South and development of its mineral resources was laid before the conference. It showed that of 185 replies to the question as to what is the most immediate economic need of the South, 41 stated that it was the development of natural resources; 25 suggested diversified agriculture and less cotton; 15 suggested diversified farming in small tracts; 23 favored introduction of northern and eastern capital; 20 suggested development of hydroelectric power; and 10 favored development of southern confidence and less expectation from outside capital. Others discussed absentee ownership and management, good roads, better tax laws, reforestation, a flat income tax of 2 percent, and repeal of inheritance tax laws.

To the query as to how the mineral resources of the South can be brought to the attention of those who invest in and develop mines, 173 replies were made, of which 40 suggested judicious advertising the same as any stock-selling proposition; 31 favored honest publicity; 22 each favored cooperation with the American Mining Congress, and publications by the state geological surveys; 19 favored the furnishing of descriptions of the resources direct to consumers; and 16 suggested demonstration of southern products in the North and East. Other replies suggested reduced rate excursions to inform other communities of southern minerals, and that mineral development locally be free of tax for a term of years.

Of 125 answers, 120 were to the effect that the publication of an authoritative and unbiased report on the location and extent of undeveloped southern mineral resources would aid in securing capital for their development. The other five were negative.

DINNER SPEAKERS

An informal dinner was held on the evening of March 21, at which Dr. Henry Mace Payne, consulting engineer to the American Mining Congress, who handled the preliminary details of the conference, presided. Dr. Payne is secretary of the Southern Division and recently made a survey of southern mineral resources.

L. J. Folse, manager of the Mississippi State Board of Development, of Jackson, spoke on methods of "Putting Southern Resources on the Map," and was followed by Mr. Hand with an address on "Arkansas, the Wonder State." Representative Allgood spoke of the need for

diversified farming and industry, and R. G. Brown, manager of the Legan-McClure Lumber Co., of Louisville, Miss., referred to the impetus behind the development of raw materials in that state. Advances in safety work were recounted by Mr. Davidson.

At the concluding session on the morning of March 22, which was presided over by Wm. H. Lindsey, president of the American Mining Congress, the relations between banks and mining developments were discussed by Waldo Newcomer, of Baltimore, chairman of the board of the Baltimore Trust Co., who outline principles involving the financing of mining enterprises. He



Waldo Newcomer

spoke particularly of relations that should exist between miners and bankers. "Every mining proposition of any size requires the assistance and backing of banking," said Mr. Newcomer. He denied that bankers have a prejudice against mining propositions. Because mining propositions involve large amounts, Mr. Newcomer said, banks of sufficient size and strength should be sought to handle the enterprise. The bank should also have some knowledge of the nature of a mine's requirements. Mining men and bankers should also be favorably known to each other in order that their negotiations might prove satisfactory.

MINE FINANCING

Mr. Newcomer stated that in financing mining enterprises there must be absolute integrity on the part of those interested in the mine. He stated that banks are cautious in making mining loans. Mr. Newcomer said loans should only be made to mining propositions which are managed by honest, practical, and experienced men. In considering mining loans, Mr. Newcomer said banks take into account economy of mining, availability of labor at reasonable prices, demand for the product, transportation facilities, and the possibility of the mines being closed by strikes. "The investigation must be made almost in a spirit of trying to prove the proposition inadvisable," he said. "It must be rigid, cold-blooded, and conservative. A reasonable amount of money should be put into the proposition by the owners. The banker must almost become a partner in the transaction, but should not be in a position where he is the only one to lose. It should be pos-

sible for him to recover his money and have the owner take the loss if the proposition is bad. Careful scrutiny must be made of the financial plan. No transaction ever worked out better than the original plan, except where some remarkably valuable deposit was unexpectedly unearthed, but many have fallen short of expectations. The proposition must show a good margin of safety. There should be a fair margin of operating profits under normal conditions, and the mine should not be dependent on profits of exceptional years. There must be adequacy of financing, as it is disheartening to start into a deal believing half a million dollars will be sufficient and then find another half million must be put up or that originally invested is lost. There should be a proper and ample sinking fund and adequate provision for depletion as the mine is worked. There should be adequate profit to the bank in the transaction, as such a loan can not be treated on the basis of a loan to a merchant with ample quick resources and the assurance that the money will be returned in six months or a year. Consideration must be given the fact that much preparatory work is necessary, that no profits can come in for some time, that there is a large amount of money involved, that the proposition will require watching, and that some will fail. The banker can not go into these enterprises unless there is adequate profit as an inducement. After the loan is made the banker must keep in touch with the proposition, advise on the financial side, and appreciate difficulties that arise. The mine must appreciate that the bankers' resources are derived entirely from deposits payable on demand, and that they represent other people's money for which the banker is a trustee and must protect his interests. Few banks can afford to tie up large amounts in long-time capital loans. They must receive for their advances securities that are readily salable. To take bonds and stocks and lock them in vaults would be suicidal. The main basis for these advances must be bonds so well secured that they are salable and so strong that the banker can recommend them to capitalists. The confidence of the public is a banker's greatest asset. Those seeking loans from banks should have absolute frankness and openness in their negotiations. Drastic requirements made by bankers are necessary to make the securities safe and salable and to insure the success of the project. The management of the mine should not wait until it is in difficulties and then ask for more funds, but should make frank reports of progress, showing whether the difficulties are small and due to temporary causes or whether they are fundamentally unsatisfactory."

George H. Bailey, counsel of the American Mining Congress, made a brief address outlining certain functions of the organization and their application to the development of southern industry.

PUBLIC OWNERSHIP

"Business should be encouraged and not hampered by legislative tyranny," said Henry Swift Ives, vice president of the Casualty Information Clearing House of Chicago, in a speech on "Putting the South in the Nation's Show Window." He asked the South to take the lead in a fight against "stifling business in a political straight jacket," and for an industrial declaration of independence.

"The South is emerging from dependence upon agriculture and is on the threshold of an era of industrial development," said Mr. Ives. "Business is seeking escape from oppressive taxation, government interference, legal discriminations, unsatisfactory labor conditions involving frequent strikes, and legislative harassments. There must be no chasing of fantastic moonbeams radiated by fake liberalism, and no application of the demoralizing creeds 'soak the rich' and 'production for use, not profit.' Democracy and capitalism are twin institutions. The South is in a position to prove that democracy is able to solve the complex problems of the new industrial era without resort to the deadening and coercive schemes of socialism."

In denying the old theory that making the rich richer makes the poor poorer, Mr. Ives said additional prosperity for a few means increased and widely distributed prosperity for the many. Mr. Ives opposed Government operation and ownership of industries, declaring it to be an economic and social folly, breeding financial and industrial disaster, oppressive taxation, bureaucratic administration and political autocracy. "Government ownership is the product of loafing minds and loitering ambitions," he said. "It is the indolent offspring of a static mind. As a theory, it lacks imagination, originality, inspiration and romance. As an actuality, it is a stupid, dull, lan-

guorous method of carrying on the work of the world. It is the substitution of Government deficits for private profits. It is a stubborn barrier to industrial progress. It is the Santa Claus idea of government, heralded by political sleigh-bell ringers. It has never created anything except jobs. It is destructive of growth of wealth and productive of growth of debt. If reform is needed in our industrial system it must come from within. Political government is not adapted to industrial government, and industrial government is not suited for political government. Business is conducted with a higher degree of fairness, equity and justice to those who are in it, and with more appreciation of its responsibility to serve the public than any similar governmental enterprise. Industry is running itself better than any government is being run. The effect of state interference is to supplant order with confusion and to promote deficits in the place of profits. Industry is two jumps ahead of the requirements of the people, while most government organizations are two jumps behind."

MINE CONTROL

Mr. Ives said railroad, electric light, power, gas, traction, telegraph, telephone, and insurance companies had borne the brunt of the fight against public ownership. "The public ownership propaganda is now being directed at industries performing a semi-public service or engaged in the development of natural resources," he said. "It is now proposed to socialize coal mines, steel mills, lumber production, grain elevators, flour mills, packing houses, steamship lines, warehouses, oil production, and other en-

terprises. All of these are essential to economic progress and any community which subscribes to the public ownership program will be compelled to look a long way for the capital for successful development of these resources. The capital account of a government enterprise is static; that of private enterprise is active. The former 'toils not, neither does it spin,' the latter energizes production and builds states.

"Government is an agency established to protect life, liberty, property and the pursuit of happiness. It is an instrument of man and not a competitor with him or a master over him. The true end of government is not to stick its incompetent nose into every man's business, but to preserve for the individual an open field for his energies and faculties in which he, and not the Government, may reap the rewards of his efforts. The South should protect its people against the demoralizing and enervating effects of the new socialistic dispensation disguised as liberalism and misbranded as altruism."

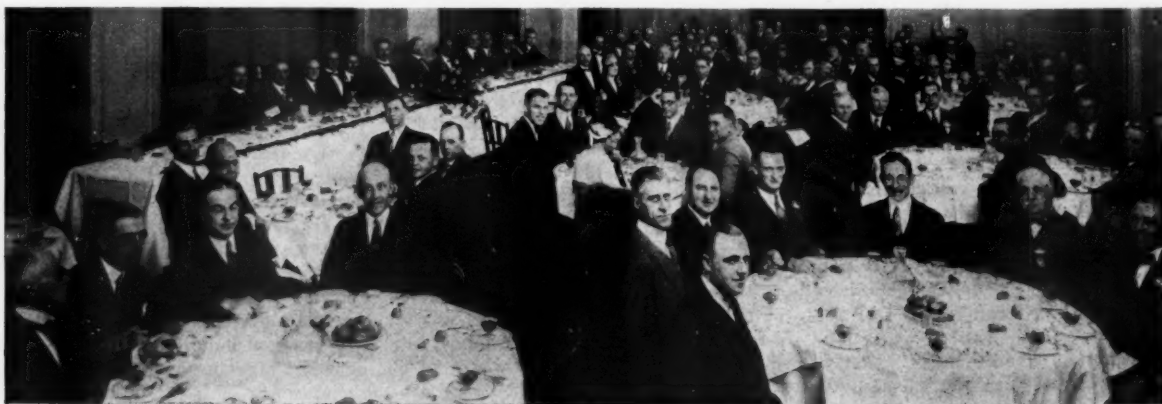
The concluding speaker at the conference was William Crooks, consulting engineer of Little Rock, who discussed the development of southern natural resources.

INSPECTION TOUR

Iron and steel operations in the Birmingham district were inspected by the delegates on the afternoon of Tuesday, March 22, following the close of the conference. The delegates left Birmingham over the Louisville & Nashville Railroad and visited the Fairfield works, the rail mill, and the new high line up the mountain. This complimentary excursion was tendered to the delegates by the Tennessee Coal, Iron & Railway Co., the Louisville and Nashville Railroad Co. and the Alabama Mining Institute, which latter cooperated in conducting the conference. Beginning the morning of March 23 and continuing until March 26 the delegates made a tour of industries in Alabama and Mississippi. They left Birmingham the night of March 22 on the "Pan-American" for (Continued on page 314)



H. S. Ives



Informal Dinner to the Delegates to the Southern Industrial Development Conference



LEGISLATIVE REVIEW

Congress Ends Session With Many Measures Remaining Unenacted—Some Mining Proposals Fail Of Passage—Uncompleted Legislation Must Be Reintroduced At Next Session Beginning In December, Unless Extra Session Is Called, Which Seems Unlikely—New Bills Introduced In Closing Session As A Basis For Consideration At Next Session

WHEN Congress adjourned on March 4, not to meet again until December 5, unless an extra session is called by the President, which now seems unlikely, it left behind a long stream of legislative proposals. Of nearly 25,000 bills and resolutions introduced in the last two years, only 1,422 became laws and many of these were of a private character. In the House 18,312 bills and resolutions were introduced while in the Senate the number totaled 6,417. During the first session of the last Congress 896 laws were passed and approved by the President, while in the second and last session, 526 were approved. House committees made 2,319 reports on bills and Senate committees 1,717 reports. The Government departments made 1,055 reports to Congress,

Photographs from the exquisite picturization, "Washington, Our National Shrine," by Charles Colfax-Long.

while the President sent 100 messages. With the end of the Congress all of the uncompleted legislation was practically discarded, and it will be necessary in the new Congress to reintroduce these bills in order for them to receive further consideration.

The main objective of the next session of Congress will be to revise the tax law and reduce Federal tax rates. For this purpose a congressional investigating committee representing the House Ways and Means Committee and the Senate Finance Committee will during the congressional recess complete an investigation looking to revision of tax rates and administrative procedure under the tax

system. Its conclusions will be the basis on which the Ways and Means Committee will draft a new tax law. The tax investigating committee has already submitted two reports based on its investigations during the last year, one on the operation of the 27½ percent oil depletion rate, and the other on evasion of taxes by corporations. The Ways and Means Committee expects to begin consideration of the new tax law in October. Suggestions in this connection are expected to be made by the American Mining Congress through its tax division for changes in provisions affecting mining taxation. A proposal which is expected to receive consideration is one advanced by Representative Englebright, Republican, California, to exempt income and dividends from gold mining in the United

States by domestic corporations, from the Federal income tax.

A proposed system of Federal aid to the states in advancing mine safety work was suggested in a bill introduced by Representative Perlman, Republican, New York.

It is expected that in the new Congress bills for the purchase by the Government of 15,000,000 ounces of silver at \$1 per ounce to complete purchases under the Pittman Act, and amending the war mineral relief act by authorizing payment of losses in connection with purchase of property and interest on borrowed money, and for appeals to the Court of Claims will be reintroduced, as this legislation failed in the last Congress.

New bills to regulate the issuance of mining and other securities appeared in both the Senate and House, but an attempt to authorize the Judiciary Committee to consider this matter during the recess until December, failed.

Creation of a Department of Conservation to protect wild animal life and national forests, which would cover plans to eliminate pollution of waters, was proposed in bills introduced in the Senate and House.

Several mining bills were enacted into law during the last session. These included the measure to relieve owners of land from drilling costs in potash explorations conducted by the Government in case potash is not found on their lands; amending the helium conservation law by authorizing the sale or lease of helium for commercial development; authorizing oil and gas mining leases on executive order Indian reservations; postponing adjustment of Northern Pacific Railroad land grants, in which classification of mineral lands is involved; authorizing oil and gas leases on lands of the Fort Peck Indians in Montana, and establishing an organic act for the work of the Bureau of Foreign and Domestic Commerce, which has heretofore been conducted under annual appropriations.

Railroad legislation was considered by Congress in the closing days of the recent session. A new bill for consolidation of railroads was presented for study during the recess with a view of action next session. A proposal to substitute for the present law guaranteeing earnings to railroads, a provision authorizing rates on an average income basis necessary to meet the transportation needs of the country, was advanced. A law was passed authorizing reduced freight rates in case of emergencies such as earthquake or other calamity. A constitutional amendment to give the states control over state rates was proposed.

The Senate authorized the continuance of its special committee which has been investigating the Tariff Commission and

the operation of the flexible tariff law. No action was taken on a resolution introduced by Senator Walsh, Democrat, Montana, for an investigation of operating and holding companies in the electrical industry.

Bills proposing to lease the Muscle Shoals, Alabama, nitrate and power project and to adjust alien property and war claims went over until the next session, as did also the bill to develop power on the Colorado River. A new plan was suggested for development of the river under a commission of 16 members to be appointed by the President from persons nominated by the Governors of Western States.

Extensive appropriations for conservation and proper use of forests and timber, including timber for mining, were proposed in a measure presented in the House.

COAL CONTROL

H. R. 16972. Defeated in committee. This coal control bill provided:

"That (a) whenever the President is of opinion that an emergency exists on account of a shortage of coal, which substantially restrains, interrupts, or interferes with interstate or foreign commerce, he shall by proclamation declare the existence of such emergency.

"(b) Whenever the President is of the opinion that such emergency has terminated he shall by proclamation declare such fact.

"(c) At any time during the existence of an emergency as declared under this section the President may appoint, and fix the compensation of, a Federal fuel administrator, whose term of office shall expire upon the date when such emergency is declared to have terminated. The Bureau of Mines shall have the custody of any records of the office of Federal fuel administrator except during the term of office of any Federal fuel administrator.

"The Federal fuel administrator shall, under the direction of the President—

"(a) Ascertain whether the available supply of fuel is being distributed in a fair and equitable manner throughout the United States, and the causes of shortage of fuel in any locality;

"(b) Cooperate with any department or agency of the Government of the United States, of any state, territory, district, possession, or political subdivision thereof, in securing an equitable distribution of fuel; and

"(c) Submit such reports and recommendations to the Interstate Commerce Commission as he may deem advisable and necessary for carrying out the purposes of this act.

"Paragraph (15) of section 1 of the Interstate Commerce Act, as amended, is amended by adding at the end thereof the following sentence:

"Any emergency proclaimed by the President in accordance with the provisions of the Emergency Fuel Act of 1927 shall be deemed an emergency within the meaning of this paragraph; and until the termination of such emergency has been proclaimed by the President under such act, the commission may exercise its authority under this paragraph in such manner as it deems best calculated to relieve shortage of fuel in any locality during such emergency, and, if any Federal fuel administrator has been appointed, shall give full consideration to any report and recommendation that may be received from him."

"The Federal fuel administrator is authorized (a) in accordance with the Classification Act of 1923 and subject to the provisions of the civil service laws, to appoint and fix the salaries of such officers and employees, and (b) make such expenditures (including expenditures for rent and personal services at the seat of government and elsewhere, law books, periodicals, books of reference, and printing and binding), as may be necessary to enable him to carry out the functions vested in him by this act.

"There are hereby authorized to be appropriated such sums as may be necessary for the administration of this act, to be available until expended for expenses incurred during an emergency proclaimed under this act.

"SEC. 6. As used in this act—

"(a) The term 'person' means individual, partnership, association, or corporation.

"(b) The term 'fuel' means any product of a mine or well which is used for fuel, either in its raw state or as a first product of manufacture, including anthracite and bituminous coal, lignite, peat, coke, briquettes, oil, and natural and manufactured gas.

"(c) The term 'coal' includes anthracite and bituminous coal and lignite.

"This act may be cited as the 'Emergency Fuel Act of 1927.'"

MINERAL LANDS

S. 5438. Introduced by Mr. King (Dem., Utah). Referred to the Committee on Public Lands. The bill provides:

"That in the discretion of the Secretary of the Interior locations made under the lode mining laws of the United States upon unreserved public lands claimed to contain, at depth, gold, silver, cinnabar, lead, tin, copper or other valuable deposits, the actual existence of which can be demonstrated only through deep shafts or other deep underground workings, may be passed to patent upon evidence satisfactory to him of the mineral character of the land, without the requirement that applicants show an actual discovery of mineral upon or within the

WIRE ROPE STANDARDS

The Wire Rope Committee of the Outside Coal Handling Equipment Section of the Coal Mining Branch, National Standardization Division, the American Mining Congress has released to the industry its final recommendation upon this subject.

Copies of this Code are obtainable either as a separate code or in conjunction with other Standards in the Handbook of Standard and Approved Coal Mining Methods, Practice and Equipment.

limits of their claim or claims: *Provided*, That not to exceed 640 acres of land may be located, held, applied for by, or patented to any one individual or corporation under the provisions of this act. That the Secretary of the Interior is authorized to make any rules and regulations necessary to carry this act into effect."

POTASH EXPLORATION

H. R. 15827. Enacted into law. This law amends the Government potash exploration act regarding drilling contracts to read as follows:

"The Secretary of the Interior and the Secretary of Commerce jointly are hereby authorized, within their discretion, to cooperate under formal agreement with individuals, associations, corporations, states, and municipalities, educational institutions, or other bodies, for the purposes of this act: *Provided*, That before undertaking drilling operations upon any tract or tracts of land, the mineral deposits of which are not the property of the United States, the Secretary of the Interior and the Secretary of Commerce jointly shall enter into a contract or contracts with the owners or lessees, or both, of the mineral rights therein, and the aforesaid contract or contracts shall provide, among other things, that, if deposits of potash minerals or oil shall be discovered in pursuance of operations under said contract or contracts and if and when said mineral deposits shall be mined and sold, the owners or lessees, or both, of said mineral rights shall pay to the Government and its cooperators a royalty of not less than 2½ percent of the sale value of any potash minerals and oil therefrom, said payments to continue until such time as the total amount derived from said royalty is equal to not more than the cost of the exploration, as may be determined by the Secretary of the Interior and the Secretary of Commerce jointly: *Provided further*, That all Federal claims for reimbursement under this act shall automatically expire 20 years from the date of approval of the contracts entered into, in accordance with the provisions thereof, unless sooner terminated by agreement between the owners or lessees of the potash mineral rights and oil and the Secretary of the Interior and the Secretary of Commerce jointly: *Provided further*, That said contract or contracts shall not restrict the Secretary of the Interior and the Secretary of Commerce jointly in the choice of drilling locations within the property or in the conduct of the exploratory operations, so long as such selection or conduct do not interfere unreasonably with the surface of the land or with the improvements thereof, and said contract or contracts shall provide that the United States shall not be liable for damages on account of such reasonable use of the surface as may be necessary in the proper conduct of the work."

POTASH LEASES

H. R. 5243. Enacted into law. This law authorizes potash prospecting permits and leases on public lands. The law reads as follows:

"That the Secretary of the Interior is hereby authorized, under such rules and regulations as he may prescribe, to grant to any qualified applicant a prospecting permit which shall give the exclusive

right to prospect for chlorides, sulphates, carbonates, borates, silicates, or nitrates of potassium in lands belonging to the United States for a period of not exceeding two years: *Provided*, That the area to be included in such a permit shall not exceed 2,560 acres of land in reasonably compact form: *Provided further*, That the prospecting provisions of this act shall not apply to lands and deposits in or adjacent to Searles Lake, Calif., which lands may be leased by the Secretary of the Interior under the terms and provisions of this act.

"That upon showing to the satisfaction of the Secretary of the Interior that valuable deposits of one of the substances enumerated in this act has been discovered by the permittee within the area covered by his permit, and that such land is chiefly valuable therefor, the permittee shall be entitled to a lease for any or all of the land embraced in the prospecting permit, at a royalty of not less than 2 percent of the quantity or gross value of the output of potassium compounds and other related products, except sodium, at the point of shipment to market, such lease to be taken in compact form by legal subdivisions of the public land surveys, or if the land be not surveyed, by survey executed at the cost of the permittee in accordance with regulations prescribed by the Secretary of the Interior.

"That lands known to contain valuable deposits enumerated in this act and not covered by permits or leases shall be held subject to lease by the Secretary of the Interior through advertisement, competitive bidding, or such other methods as he may by general regulations adopt, and in such areas as he shall fix, not exceeding 2,560 acres; all leases to be conditioned upon the payment by the lessee of such royalty as may be fixed in the lease, not less than 2 percent of the quantity or gross value of the output of potassium compounds and other related products, except sodium, at the point of shipment to market, and the payment in advance

of a rental of 25 cents per acre for the first calendar year or fraction thereof; 50 cents per acre for the second, third, fourth, and fifth years, respectively; and \$1 per acre per annum thereafter during the continuance of the lease, such rental for any year being credited against royalties accruing for that year. Leases under this act shall be for a period of 20 years, with preferential right in the lessee to renew the same for successive periods of 10 years upon such reasonable terms and conditions as may be prescribed by the Secretary of the Interior, unless otherwise provided by law at the expiration of such periods. In the discretion of the Secretary of the Interior the area involved in any lease resulting from a prospecting permit may be exempt from any rental in excess of 25 cents per acre for 20 years succeeding its issue, and the production of potassium compounds under such a lease may be exempt from any royalty in excess of the minimum prescribed in this act for the same period.

"That prospecting permits or leases may be issued under the provisions of this act for deposits of potassium in public lands, also containing deposits of coal or other minerals, on condition that such other deposits be reserved to the United States for disposal under appropriate laws: *Provided*, That if the interests of the Government and of the lessee will be subserved thereby, potassium leases may include covenants providing for the development by the lessee of chlorides, sulphates, carbonates, borates, silicates, or nitrates of sodium, magnesium, aluminum, or calcium, associated with the potassium deposits leased, or terms and conditions not inconsistent with the sodium provisions of the act of February 25, 1920: *Provided further*, That where valuable deposits of mineral now subject to disposition under the general mining laws are found in fissure veins on any of the lands subject to permit or lease under this act, the valuable minerals so found shall continue subject to disposition under the said general mining laws not-

IMPORTANT BILLS REVIEWED IN THIS ISSUE

- H. R. 16972—Parker (Rep., N. Y.). Coal Distribution.
- S. 5825—Oddie (Rep., Nev.). War Mineral Relief.
- S. 5438—King (Dem., Utah). Mineral Land Patent.
- H. R. 5243—Enacted Into Law. Potash Leases.
- S. 4893—Law. Oil Leases.
- H. R. 15344—Law. Helium Development.
- M. R. 16545—Parker (Rep., N. Y.). Platinum Marking.
- H. R. 16614—Madden (Rep., Ill.). Muscle Shoals Lease.
- H. R. 17069—Reported by House Committee. State Labor Laws.
- S. Con. Res. 27—Passed by Senate. Prison Labor Inquiry.
- H. J. Res. 342—Johnson (Rep., Wash.). Immigration Investigation.
- H. R. 17273—Englebright (Rep., Calif.). Gold Tax Exemption.
- H. R. 17393—Perlman (Rep., N. Y.). Mine Safety Fund.
- H. R. 17243—Dempsey (Rep., N. Y.). Security Regulation.
- S. 5818—Hawes (Dem., Mo.). Conservation Department.
- H. R. 15827—Law. Potash Exploration.
- H. R. 3858—Law. Commerce Promotion.
- S. Res. 357—Passed by Senate. Tariff Investigation.
- H. R. 10976—Law. Indian Oil Leases.
- H. R. 17390—Newton (Rep., Minn.). Railroad Rates.
- S. 3286—Law. Reduced Emergency Rates.
- S. J. Res. 172—Mayfield (Dem., Tex.). State Rates.
- S. Res. 371—Walsh (Dem., Mont.). Electrical Investigation.
- H. R. 17401—Davenport (Rep., N. Y.). Colorado River Development.
- S. Res. 378—Walsh (Dem., Mass.). Economic Investigation.
- H. R. 17406—McSweeney (Dem., Ohio). Forest and Timber Appropriations.

withstanding the presence of potash therein."

"That the general provisions of sections 1 and 26 to 38, inclusive, of the act of February 25, 1920, are made applicable to permits and leases under this act, the first and thirty-seventh sections thereof being amended to include deposits of potassium."

"That the act of October 2, 1917, is hereby repealed, but this repeal shall not affect pending applications for permits or leases filed prior to January 1, 1926, or valid claims existent at date of the passage of this act and thereafter maintained in compliance with the laws under which initiated, which claims may be perfected under such laws, including discovery."

GOLD TAX EXEMPTION

H. R. 17273. Introduced by Mr. Englebright (Rep., Calif.). Referred to the Committee on Ways and Means. This bill proposes to exempt from income tax income derived from the mining of gold in the United States and dividends from domestic corporations resulting from gold mining in this country.

MINE SAFETY

H. R. 17393. Introduced by Mr. Perlman (Rep., N. Y.). Referred to the Committee on Interstate Commerce. This bill proposes Federal appropriations to aid the states in promoting the welfare, safety and health of miners. It proposes to appropriate \$80,000 for the current fiscal year and \$240,000 each for the next five years, and an additional sum of \$1,000,000 for each of the next five years. These funds are to be equally divided between the states. Of the additional \$1,000,000, each state shall receive \$5,000 and the balance shall be distributed among the states in proportion to the number of miners therein. The states are to provide an equal amount to that allotted by the Government.

The bill creates a board of mine safety consisting of the Director of the Bureau of Mines, Surgeon General of the Public Health Service, and the Commissioner or Labor Statistics. The Director of the Bureau of Mines is to be the executive officer charged with administration of the act. The Bureau is to make studies and investigations to promote efficient administration of the act. The states are to create agencies with which the Bureau of Mines shall cooperate in carrying out the law. States having bureaus of mines shall have the law administered through such bureaus. For administration of the law the Bureau of Mines is given 5 percent of the annual funds. States desiring to receive benefits under the act shall submit to the Bureau of Mines plans for carrying out the act in the state, which much be approved by the Mine Safety Board. Each state cooperating with the bureau under this act shall report its operations and expenditures as requested

by the Bureau of Mines. If the states do not properly expend the funds further allotments may be withheld by the Bureau of Mines, but the states may have the right to appeal from such action to the President. The states are forbidden from using Federal allotments for the purchase, repair or rental of buildings or equipment. The states shall control the administration of the act within their jurisdiction, subject to the provisions of the Federal law.

WAR MINERALS

S. 5825. Introduced by Mr. Oddie (Rep., Nev.). Reported by the Committee on Mines and Mining. This bill proposed to refer war mineral claims to the Court of Claims.

BLUS SKY BILL

H. R. 17245. Introduced by Mr. Dempsey (Rep., N. Y.). Referred to the Judiciary Committee. This is a new draft of a proposed blue sky law to regulate the issuance of securities, including those for oil, gas, or mining leases. The purpose of the bill is to prevent fraud in the sale of such securities. It would be enforced by the Department of Justice.

CONSERVATION DEPARTMENT

S. 5818. Introduced by Mr. Hawes (Dem., Mo.). Referred to the Committee on Interstate Commerce. This bill proposed to create a department of conservation to develop wild animal life and national forests; to perform functions relating to other lands and waters and to minimize or eliminate pollution of waters detrimental to wild animal life. The bill proposes to transfer to this department the Forest Service of the Department of Agriculture and other Government bureaus having jurisdiction and control of any land and waters.

S. 4893. Enacted into law. This law authorizes oil and gas mining leases on executive order Indian reservations.

DRAINAGE STANDARDS

The Coal Mine Drainage Committee of the National Standardization Division of the American Mining Congress has released to the industry its final recommendations on Drainage Equipment. These recommendations cover Pumps for Development Work; Permanent Pumping Stations; Natural Drainage and Unwatering Abandoned Workings. Copies of this code are available separately, or in conjunction with the Handbook of Standard and Approved Coal Mining Methods, Practice and Equipment.

LAND GRANTS

H. J. Res. 363. Enacted into law. This law provides that the Interior Department shall suspend approval of adjustments of Northern Pacific Railroad land grants until June 1, 1928; continues the congressional commission which has investigated the grants until March 4, 1929, and requests the Attorney General to advise as to legal or legislative action to be taken in adjusting the grants.

H. R. 10976. Enacted into law. This law authorizes the Fort Peck, Montana, Indians to make oil and gas leases on their land, under regulations by and with the approval of the Interior Department.

COMMERCE PROMOTION

H. R. 3858. Enacted into law. This law establishes an organic act for the work of the Bureau of Foreign and Domestic Commerce, which has heretofore been conducted under annual appropriations.

H. J. Res. 373. Passed by the House. This resolution proposed to authorize the House Committee on Ways and Means to consider during the congressional recess bills to revise the revenue and customs laws.

S. Res. 357. Passed by the Senate. This resolution continues the Senate Committee which has been investigating the Tariff Commission until the end of the next session of Congress in 1928.

H. Res. 454. Passed by the House. This resolution authorizes the House Immigration Committee to consider revision of the immigration law during the congressional recess.

ELECTRICAL INQUIRY

S. Res. 371. Introduced by Mr. Walsh (Dem., Mont.). Referred to the Expenses Committee. This resolution proposed an investigation of the electrical industry by five Senators, covering the growth of capital of public utility corporations supplying either electrical energy in the form of light or power, however produced, or gas, natural or artificial, and corporations holding stocks of such operating companies. The inquiry would also cover the method of issuing and the price or value received for securities of both classes of corporations, including bonds and other debts and stocks; the extent to which additions or extensions of properties of operating companies have been made and the value or detriment to the public of holding companies owning stock or otherwise controlling operating companies; the extent of such ownership or control, and what legislation should be passed by Congress to correct abuses in the organization or operation of such companies.

S. 3331. Amendment to introduced by Mr. Cameron (Rep., Ariz.). This amend-

ment proposed to the Colorado River development bill, was identical with S. 4710, previously introduced by the Senator, to create a waterways and water resources commission to develop water power policies.

Mr. Cameron also introduced amendments for location of the reservoir at Bridge or Glen Canyons instead of at Black or Boulder Canyons; and increasing the appropriation for the development works from \$125,000,000 to \$175,000,000.

Mr. Johnson (Rep., Calif.), introduced an amendment exempting Utah from the state agreement.

Mr. Phipps (Rep., Colo.), introduced an amendment in the nature of a substitute, providing for the reservoir at Black or Boulder Canyons or other advantageous place to be determined by the Interior Department, and reducing the appropriation to \$90,000,000.

Mr. Ashurst (Dem., Ariz.), introduced amendments providing that the act should not interfere with the laws of any state relating to the control of irrigation

water; for location of the reservoir to be selected by engineers appointed by the President, and allocating 35 percent of power developed at the project to Arizona, California and Nevada.

H. R. 17401. Introduced by Mr. Davenport (Rep., N. Y.). Referred to the Irrigation Committee. This bill proposes the development of the Colorado River under 16 commissioners to be appointed by the President from nominees by Governors of the Western States involved.

H. J. Res. 345. Enacted into law. This law provides for engineering studies regarding the equitable use of the waters of the lower Rio Grande and Colorado Rivers, and appropriates \$50,000.

INTERNATIONAL CONFERENCES

H. J. Res. 351. Enacted into law. This resolution appropriates \$15,000 for participation by the United States in an economic conference at Geneva, Switzerland.

H. J. Res. 352. Enacted into law. This resolution appropriates \$75,000 for participation by the United States in an armament reduction conference at Geneva.

FOREST PRESERVATION

H. R. 17406. Introduced by Mr. McSweeney (Dem., Ohio). Referred to the Committee on Agriculture. This bill proposes annual appropriations of \$1,000,000 for forest investigations at various experiment stations; \$250,000 each for tests at the Forest Products Laboratory of tree diseases and insect injuries to trees; \$90,000 for investigations of animals which injure trees; \$50,000 for investigations of weather conditions in relation to forest fires; \$275,000 for improved methods of timber growing; \$1,000,000 for experiments as to the chemical and physical properties and the use and preservation of wood at the Forest Products Laboratory; \$50,000 for similar tests on foreign woods; \$250,000 or not more than \$3,000,000 for allotments to states and other agencies in surveys of timber requirements; and \$250,000 for studies of reforestation, which latter shall cover investigations to insure the profitable use of timber in the mining and other industries.



Entrance to the temporary White House



METALS

PRACTICAL OPERATING MEN'S DEPARTMENT

GUY N. BJORGE, Editor

*Practical Operating Problems of the
Metal Mining Industry*



STEAM SHOVEL PROBLEMS AT UNITED VERDE*

Ore Body At This Property Has Been On Fire Since 1894, Which Makes Steam Shovel Problem Serious One—How Difficulties Have Been Overcome

By J. C. PERKINS†

THE Steam Shovel mine of the United Verde Copper Company, designed primarily to remove overburden from a vertical ore body that has been on fire for many years, has presented and continues to present many difficulties. The material to be removed consists of hard, crystalline rocks overlying an ore body very limited in cross sectional area, most of which, due to fire and radiated heat, could not be mined by underground methods. It is not the purpose of this paper to discuss the entire program in detail, but to cover some of the special problems encountered.

The original plans called for the removal of material above the 160 level with steam shovels and the material between the 160 and 500 levels by means of millhole or gloryhole methods. As the work progressed the millhole method was changed to a shovel job, using small electric shovels and motor trucks.

The steam shovel pit had eight major levels. The bottom or 160 level had a bank 110 ft. high; the next six levels above had banks approximately 50 ft. high; while the top level had a bank varying in height from a few feet to 140 ft. Standard gauge railroad tracks connected each level by means of an elaborate system of switchbacks. The switchbacks were laid out with the tailtracks on

the pit end connecting with the levels. Waste dumps were maintained along the switchbacks and at near-by points.

In developing the steam shovel pit two 4-yd. Osgood shovels established the three levels immediately above the 160 level, excavating material from the comparatively flat-lying slope of the hill. This work permitted the 8-yd. Marion shovel to make a thoroughcut from the 160 surface level across the pit and over to the old gloryhole. With the establishment of the three levels above the 160 level, the Osgood shovels were moved to the uppermost levels and excavation started toward the completion of each level as the shovels worked the lower levels. In the meantime the Marion shovel had completed the cut across the 160 level and widened the cut until no more material could be removed without interfering with the levels above. It was necessary to either discontinue operating the big shovel and wait a year and a half for the shovels above to complete the upper levels, or to consolidate the 160 level with a part of the levels above. The latter method was chosen and was accomplished by splitting the pit into two parts, the southwest half, with a 320-ft. bank, and the northeast half, consisting of a bottom bench 110 ft. high and a series of short benches 50 ft. high. This threw approximately half of the available yardage to the 8-yd. shovel which

was better able to operate against a high bank, and the balance to the 4-yd. shovels. The bottom bench on the northeast half was left at 110 ft. for final clean up by the 8-yd. shovel on completion of the higher bank to the south. The crest of the 320-ft. bank was on the third level from the top.

As the work progressed downward from the top on the northeast half of the pit, the levels that had been consolidated were once more reopened. This was accomplished by drilling churn drill holes to the proper grade, shooting them, and letting the shovel cast the material from the first cut over the bank into the 160 level pit. The cast-over material was then loaded out by the Marion shovel. This method of handling some material twice was expensive, but it was more than justified in keeping all the equipment busy and limiting the time required to complete the stripping operations. It was necessary that development of the plans below the 160 level proceed as rapidly as the stripping above would permit.

BREAKING GROUND ON 50-FT. BANKS

During the early stages of the work little difficulty was experienced in breaking ground for the two Osgood shovels being operated on the upper levels. The material consisted to a great extent of altered and weathered diorite and was easily prepared for shovel loading by drilling and shooting churn drill holes. The holes were spaced 35 to 45 ft. apart

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† Steam Shovel Superintendent, United Verde Copper Co., Jerome, Ariz.



A view of the switchback tracks necessary to reach the pit levels. Jerome Ball Park in the foreground

along the bank at a distance of 30 to 40 ft. back from the toe, and were shot with 10 to 12 boxes of powder. An occasional rib of hard diorite would be encountered along the toe of the cuts, necessitating the drilling and shooting of a few toe holes spaced at random and depending on the character of the material and the proximity of the churn drill holes. Under these conditions the cost of preparing ground was small and, on account

of good fragmentation secured in shooting, rapid shovel loading was possible with very little delay for secondary shooting.

As the operations were continued all of the surface and altered material was removed and the material encountered was all fresh diorite. This rock is very hard and blocky and extremely difficult to drill and blast. Churn drill footages dropped from 15 to 20 ft. per shift to

3 and 5 ft. per shift. The extreme hardness of the rock slowed up the speed of drilling, while the blocky formation standing practically on end made it an impossibility to drill a straight hole. On account of these conditions churn drilling was abandoned as a means of breaking this ground.

Closely spaced toe holes were resorted to for breaking the hard diorite. These holes were drilled to a depth of 20 ft. and spaced 6 to 15 ft. apart, depending on the formation and hardness of the ground. The holes were bottomed 2 to 3 ft. below grade, were heavily chambered to receive from three to five boxes of powder, and a series of 15 to 20 holes shot at one time with electric blasting caps. This method did not give the desired results. When the holes were shot the force of the explosion would undercut the bank without securing any back-break. The fragmentation was poor and a large amount of secondary blasting was necessary, with consequent delays to shovel loading. The overhanging banks caused serious delays also to the shovels on account of slides, and after cleaning up presented a dangerous condition for men to drill under.

After the failure of the above method, combination toe hole and slope blasting methods were resorted to. The toe holes were drilled in the usual manner and the slope holes were drilled from the top of the bank. The slope holes were drilled 10 ft. back from the crest of the bank, spaced $12\frac{1}{2}$ ft. apart, and drilled to a maximum depth of 30 ft. After chambering these slope holes, they were loaded

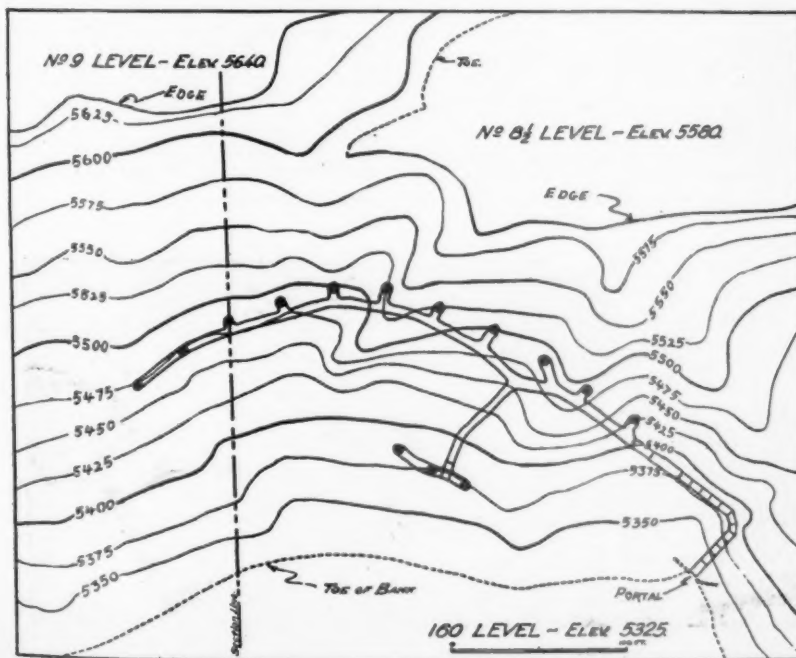
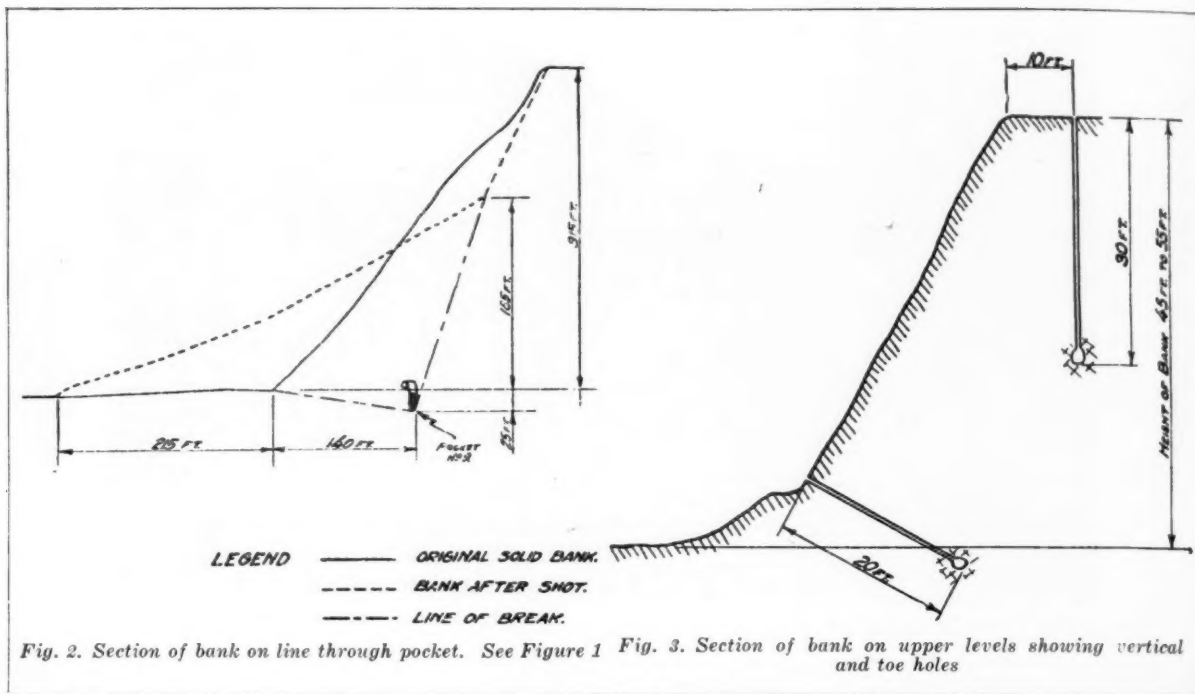


FIGURE 1.

PLAN OF COYOTE NO. 3.



with 75 to 150 lbs. of powder and shot simultaneously with the toe holes.

The results obtained from this method were highly satisfactory. The wider distribution and increased amount of powder gave a good fragmentation and considerable back-break was secured. Secondary blasting was reduced to an appreciable extent, which permitted rapid and continuous loading with the shovels and a safe bank to work under. During the early stages of the work in altered and weathered diorite, the shovels were obtaining an average of 800 cu. yds. per 8-hour shift. Direct drilling and blasting costs were low, the total being 7.26 cents per yd., of which 4.67 cents was for labor and 2.59 cents for explosives. However, as hard rock was encountered, churn drilling discontinued and closely

spaced toe holes used in shooting, the shovel yardage dropped to an average of 530 cu. yds. per shift. For this period of the operations the direct drilling and blasting costs increased to 10.69 cents per cu. yd., labor and explosives representing 6.31 cents and 4.38 cents, respectively. The inauguration of the toe and slope hole methods made a decided improvement in shovel yardage, the average being raised to 758 cu. yds. per shift. This was an improvement of 43 percent over the lowest figure and was within 95 percent of the yardage obtained in the altered material. Drilling and blasting costs increased to 18.15 cents per cu. yd., of which 11.32 cents was for labor and 6.38 cents for explosives.

In loading toe holes with stick powder, particularly where holes were in frac-

tured ground, there was not only a great delay in loading after springing but miners were inclined to use unsafe methods in forcing stick powder through the caved portion of the holes. To load 20 holes that had previously sprung with one to five cases of powder required 20 men four hours. This practice was not only costly but hazardous, due to the time and number of men required.

Loading granulated powder with compressed air was attempted, and finally the air loader shown in Figure 4 was adopted. This machine will take one case of granulated powder and by the injector principle force it through a copper tube to the chamber of the hole in six seconds. The total time for filling and loading is approximately one minute per case of powder.



A pile of broken muck after a coyote shot. Height of bank 320 ft. The 160-ft. level consolidated into the levels above



"Dante's Inferno." Gas coming through the ground into the pit

The machine has no screw connections that might develop sufficient friction to ignite the powder, and with a copper tube extending from the machine to the chamber in the hole, there is little danger of generating excessive friction. In addition, a minimum amount of time is required for the men to work under the bank which may have become dangerous due to previous springing of the holes.

Air loading of granulated powder is generally considered unsafe practice by the powder manufacturer, but in this case it was felt that, although there was a possibility of this, the faults of the other methods were more serious.

Although direct drilling and blasting costs had increased 250 percent due to the difference in the material encountered and methods used, shovel yardages were maintained. Shovel repairs naturally increased due to the coarser material being handled and also to the fact that the shovels were getting older and required more maintenance. However, by maintaining capacity production only a slight increase in total costs occurred.

In drilling toe holes Sullivan DP-331 jackhammer machines were used, since



Drilling vertical slope holes, United Verde steam-shovel pit

springing could easily be cleaned out. Attempts were made to use heavier jackhammers with faster drilling speeds, but they were more than one man could handle on a flat hole and whatever was gained in drilling speed was lost in the extra labor required.

110-ft. bank was maintained. The material composing this cut consisted of altered diorite, oxidized quartz, quartz and jasper, with certain sections covered with slag from the old smelter. The slag varied in thickness from a few feet to the full height of the bank, depending on the topography of the original surface. As the work advanced the above materials were removed and the hard, fresh diorite encountered, as was the case with the levels above.

Churn drilling and blasting methods have been employed extensively in shooting the 110-ft. bank. Drilling speeds for the various classes of rock have varied between 5 and 30 ft. per shift, the low footages being obtained in the jasper and hard diorite and the higher footages in the oxide and oxidized quartz. It was possible to get good footages through the slag by driving short pieces of casing into the hole as the drilling progressed. Of special interest in shooting the high bank has been the large quantities of powder used in the holes and the shooting of hot ground.

In shooting the holes, usually one at a time, large quantities of powder have been necessary to break through to the toe of the cut and to give a reasonable amount of back-break. The holes were drilled as near to the edge of the cut as possible and to a depth of 10 to 15 ft. below pit grade. The minimum distance from the bottom of the holes to the toe of the cut was around 55 ft. and the maximum distance approximately 95 ft. These distances and the character of the ground governed the size of the powder charge, 4,000 to 8,000 lbs. of powder being ordinary charges. In certain sections of the pit it was possible to reduce the burden on the holes with toe holes, but as the slope of the bank became steeper than $\frac{3}{4}$: 1, it became increasingly dangerous to work men under the bank on account of falling material.



Loading toe holes

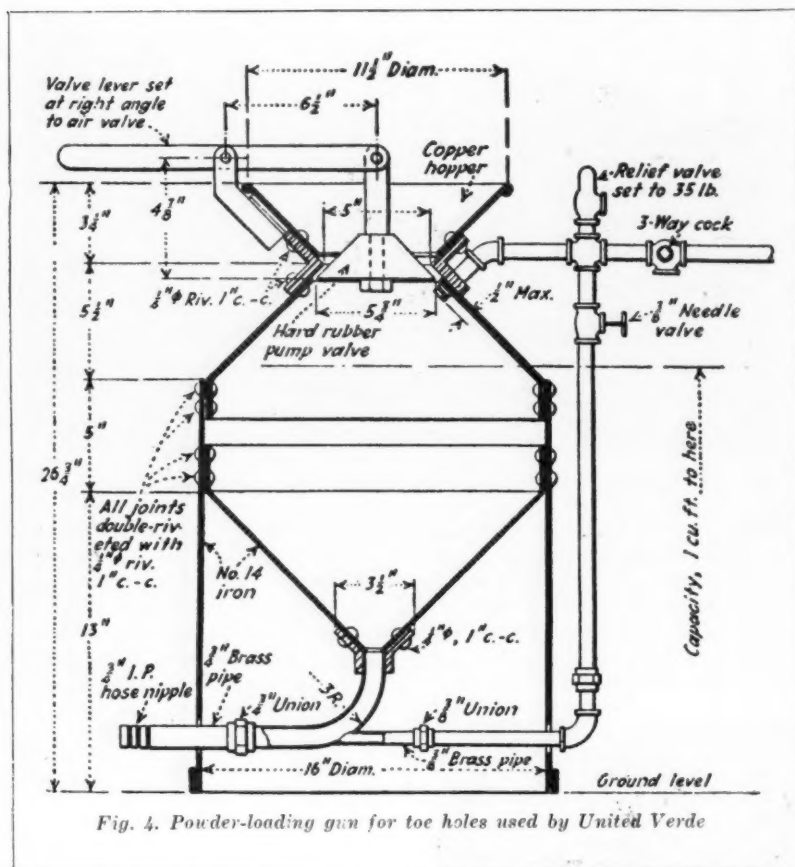
these machines are light, easily handled by one man, and will readily drill a hole to a depth of 20 ft. Attempts were made to drill toe holes to a depth of 30 ft. with Leyner machines, but the same difficulties were encountered as with the churn drills on vertical holes. Drilling speed was slow and raveling ground caused many pieces of stuck steel. In springing 30-ft. toe holes, a large number would be lost on account of caving and it was nearly impossible to open the holes once they had caved. In fact, the same troubles were present with the jackhammer holes, but when a steel stuck or a hole was lost it required no great expense or a long period of time to drill another hole in its place. It was also found that most of the 20-ft. holes which caved after

In drilling vertical slope holes Ingersoll-Rand 248 Leyner machines were used. The machines were suspended by block and tackle from 2-in. iron pipe tripods to facilitate handling, similar to the practice previously in use at Ajo.

Table I gives the essential data relative to drilling toe and slope holes, powder charges, and steel used. The total cost of machine drilling and blasting for the year 1926 is given in Table VIII. These costs include all primary machine drilling and blasting costs in all sections of the pit, also the cost of coyote blasts Nos. 2 and 3.

BREAKING GROUND ON THE 320 AND 110 FT. BANKS

In opening the initial cut across the top of the ore body on the 160 level, a



Practically all of the holes in the quartz and jasper were hot from the mine fire beneath. Temperatures in the bottom of the completed churn drill holes would range from 120° to 240° F. By running a stream of cold water into the holes for a length of time it was possible to cool them down to a degree that would permit loading before the increase in temperature became dangerous. The time required to cool the holes varied from 2 hours to as high as 24 hours. If the ground had a tendency to heat up too rapidly after cooling, a stream of water was run into the hole while loading. This necessitated the use of gelatin stick powder. A temperature of 120° F. was considered safe for loading, although a lower temperature was more desirable.

The powder was loaded into the holes by means of an inclined wooden trough. This permitted the men handling the explosives to keep away from the collar of the hole. The only person whose presence was necessary near the collar of the hole was the man handling the tamping stick. From 40 minutes to 1 hour was required to load 5,000 lbs. of powder. After loading the hole was stemmed as quickly as possible with sand that had previously been piled near the collar, the

wire connected up, and the hole shot. A large number of hot holes were shot, and in only one instance was this method a failure. This failure was caused by the powder igniting and burning up while connections were being made at the firing switch.

Considerable machine drilling and blasting was also done in mining the 110-ft. bank. In certain sections it was possible, by shooting a few well-placed toe holes loaded with as high as eight boxes of powder each, to undercut the bank and the ground above would slide into the pit. This method of shooting was especially successful in altered diorite lying on steep slips where the slips run parallel to the face of the bank. In consolidating the 110-ft. bank with the benches above, this method proved quite satisfactory and large yardages of material were obtained at very low costs. As was the case on the upper levels, the altered and weathered diorite was eventually removed and the toe holes would only undercut the bank and not bring down the rock from above.

COYOTE BLASTING

Coyote blasting was resorted to as the only method of shooting the 320 and 110 ft. banks with safety and in quantities

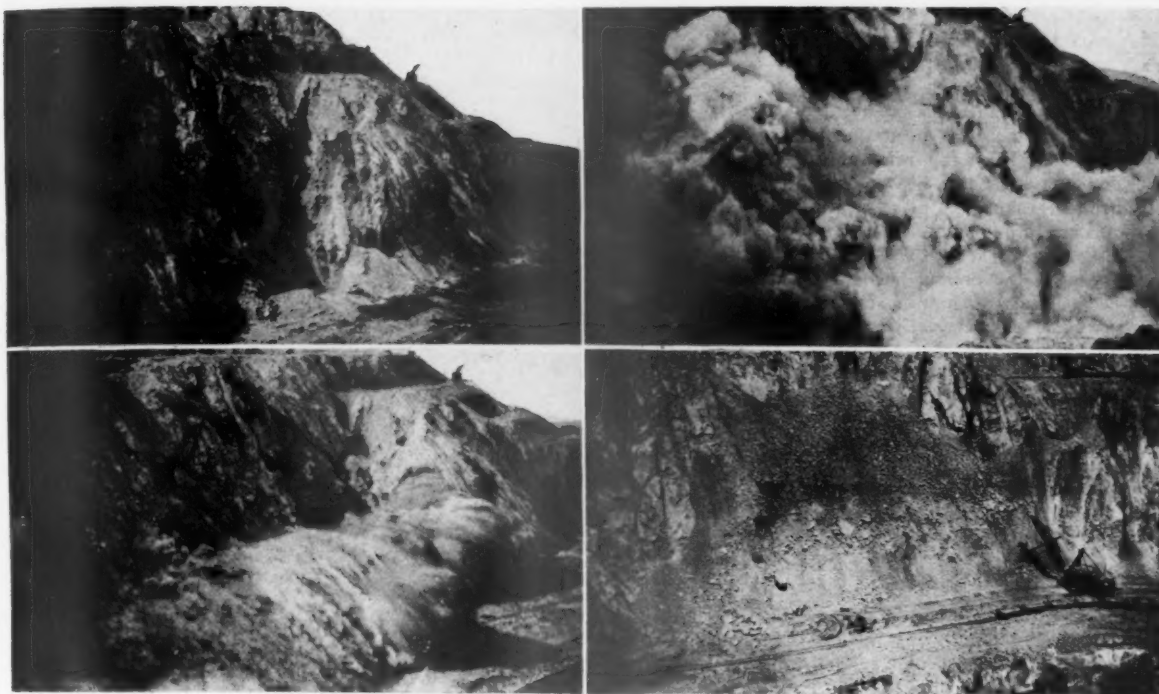
sufficient to permit efficient shovel loading. Churn drilling from the top was impossible on account of the prohibitive burden that would have been on the holes, even if economical footages in the hard diorite had been possible.

The development work of the coyote blasts consisted of driving the necessary tunnels and sinking the powder pockets at the desired distance from the face of the bank. Work was started from the face of the pit for four of the shots, while an old adit from the bank was utilized for two shots. The drifts, 4 1/2 by 6 ft. in cross section, were driven until the desired distance from the face of the cut was reached, from which point they were run parallel to the face. The distance from the drifts to the face of the cut varied from 78 to 135 ft. for the different shots. Powder pockets, 5 by 5 ft. in cross section, were sunk to a depth of 20 to 30 ft. below pit grade at intervals of 30 ft. in the drifts. Upon completion of the development work, the pockets were wired up, the powder loaded into the pockets, tamped with sand, the tunnel back-filled with muck, and the shot fired.

The hot ground encountered in the first shot is of particular interest in coyote shooting. The heat was due to radiation from the mine fire below, and a temperature of 152° F. prevailed in the ground surrounding one of the end pockets; in the other pockets it varied from 112° to 124° F. An average temperature of 95° was maintained in the drift by means of Coppus blowers and Ventube piping.

Experiments were made in the hottest pocket with black powder, 35 percent gelatin stick powder, 50 percent gelatin stick powder, No. 8 electric blasting caps, and Cordeau, to determine the effect of the heat upon them and the possibility of detonation before loading was complete. The powders and the detonating agents were placed in the bottom of the pocket, covered with dirt, and left for 50 hours, after which time they were taken out and examined. The black powder had absorbed moisture and was useless; the 35 percent gelatin had lost some of its sensitiveness; there was no appreciable change in the 50 percent gelatin; some of the tar covering on the caps had melted, but they still tested satisfactorily, which is also true of the Cordeau. Furthermore, none of the explosives tested went off during the test on account of being exposed to the heat from the ground.

To overcome the moisture and radiated heat, the pockets and drift were gunited. An inch of gunite was shot on the walls of the hottest pockets and about a half



Above—View of coyote shot No. 1. Below—An instant after the shot had been fired. 259,000 pounds of explosives were used in this shot

Above—A few minutes after firing, showing the dust after the shot. Below—After the broken rock had been partially removed

inch on the walls of the drift between pockets. The gunite did not cool off the pockets, but it materially reduced the humidity. Before loading the powder charges in the pockets, they were lined with $\frac{1}{8}$ -in. asbestos cloth to keep the powder from coming into direct contact with the hot ground.

Six coyotes were shot under the high bank with excellent results, using a total of 862,000 lbs. of powder and producing 893,000 cu. yds. of material. The average cost of shooting was 17.18 cents per cubic yard. Table II shows detailed information for each shot, including costs. After each of the first three coyote shots it was necessary to shoot the top off the

bank to give it a safe and proper slope. This was accomplished with churn drill holes after the first two shots and with 30-ft. Leyner holes drilled from the top of the bank for the third shot. The Leyner holes were drilled by placing the drill in a horizontal position on a 60-lb. rail turned over on its side and "riding the machine in."

Figure 1 shows the plan of Coyote No. 3, and Figure 2 is a section through the same shot.

CHURN DRILLING AND BLASTING

As previously stated, churn drilling and blasting have not been applicable to all conditions in breaking ground. During the last few years churn drill

holes have been used in many cases as the only means of accomplishing a desired result, such as sloping high banks, drilling hot ground, and for opening up new levels.

At present one drill crew is drilling extremely hot ground in the lower pit where trouble is being experienced in cooling hot machine drill holes, due to their size and slowness in loading. The cost of churn drilling has always been high, although excellent results are obtained from the completed holes in shooting. Table III gives the cost per foot for drilling churn drill holes during the year 1926, when 6,778 feet were drilled at a rate of 9.2 ft. per drill shift.



Type of truck and body standardized upon

A truck dumping its load into a raise

ELECTRIC SHOVEL OPERATIONS

Because of the restricted area of the pit and the fact that all stripping was on the north and west sides, it was impossible to consider spiral tracks around the perimeter, due to the delay in getting to the ore occasioned by the removal of waste. Since most of the ore was coming from underground and at a rate in excess of our rate of development, it became necessary to adopt some means of mining ore in the limited portion of the ore body already stripped. As previously stated, it was originally planned to mine all the ore and whatever waste was necessary between the 160 and 500 ft. levels by means of millhole methods. This would have permitted mining in a portion of the pit, thereby relieving the underground department to a certain extent. Millholing had been carried on for a number of years and was readily extended to the shovel cut on the 160 level. Raises connecting with ore bins on the 1,000 level were driven through to the surface. The material mined was passed through the raises, stopped on a grizzly on the 900 level, where boulders were blockholed and dropped into the bins, thence into cars and taken $1\frac{1}{2}$ miles through Hopewell Tunnel to the surface transfer bins. As the millhole work increased in scope two serious problems were presented; clean mining, which is essential, was not being obtained, and it was becoming increasingly difficult to drive raises where desired, due to the fire area.

In mining ore where direct smelting is practiced, it is necessary that the ore be mined clean. In millhole mining this is possible only when the ore is quite uniform in character or where control may be obtained by close spacing of glory-holes. Once a cut is started in the millhole, it must proceed to the top and the material taken as it is encountered. With alternate sections of ore and waste occurring, clean separation is impossible and serious dilution of the ore takes place. Thus the millholes were not practical from an economical standpoint.

The inability to drive raises to the surface as desired was due to large areas being tied up in the fire zone below the 160 level. Thus it was evident that in order to mine certain sections that could not be milled into the existing raises some method which would fit into the restricted area would have to be adopted for loading and transporting ore to the raises. The above conditions led to the installation of a small electric shovel and four motor trucks for mining during the early part of 1925. The shovel was used for loading the ore and waste and the trucks for transporting the material to the raise. The shovel was of the full revolving type, mounted on caterpillars, and equipped with a $1\frac{1}{4}$ -yd. dipper.



An Osgood 120-ton shovel working under 50-ft. banks



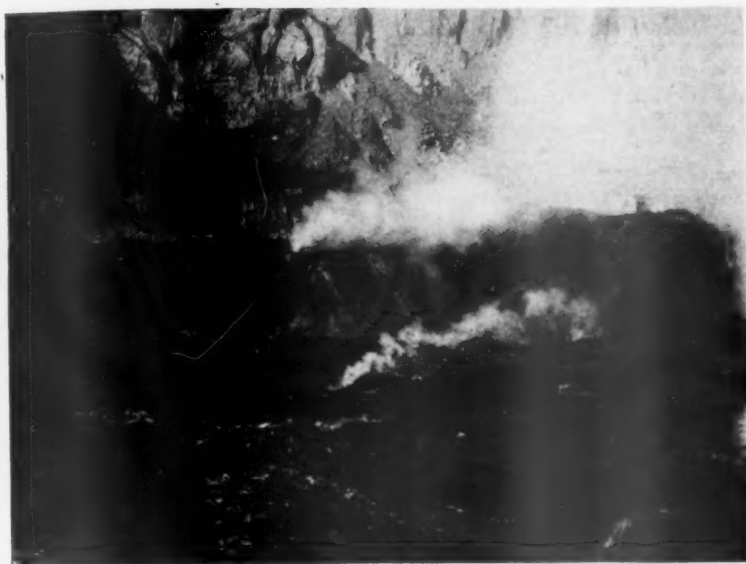
Marion 300-ton shovel working in the 160-ft. level pit



An electric shovel loading ore into a truck

With this shovel it was possible to separate different classes of material very easily. Where a bank of ore is flanked on either side with waste, it is possible by separate shooting to remove

one class of material, then shoot and remove the other class without mixing. Flexibility is given to these operations by the caterpillar mounting of the shovel; the shovel can be moved from



Gas being emitted into the lower pit. This gas comes from the portion of the mine which has been on fire since 1894 and which is now being mined by shovel and open-cut methods

one class of material to another as desired and can work into narrow cuts and on steep grades.

Also, as the ore close to the surface frequently carries high values in gold and silver, extreme care and rapid sampling and assaying are necessary to prevent loss. Samples are run on an overhead wire by gravity to the assay office on the 300-ft. level, and returns phoned to the pit.

Since a large portion of the ore consists of massive iron sulphide running from nothing to 30 percent copper, extremely careful sampling of all faces is required before shooting, or, in fact, before drilling the ground, as optical sampling in the iron is impossible.

Flexibility of operation and clean mining were the deciding factors in choosing between the small revolving shovel and the heavy standard type shovel. With the standard type shovel the excavating must proceed along straight lines and the material removed as encountered, regardless of its character. Furthermore, since the standard type shovel excavates ahead of itself, close separation of ore and waste would not have been possible and extensive stock-piling of ore would have been necessary. Low operating costs would have been obtained only by shooting on a large scale, with a resulting mixture of ore and waste. These conditions are not present with the small electric shovel and any of several classes of ore can be mined as desired.

Three electric shovels have been installed in the lower pit, working against a 30-ft. bank. Table IV gives the costs and data for loading with electric shovels

for the year 1926. The total cost of 18.38 cents per cubic yard is approximately equivalent to 9.19 cents per ton of material loaded.

TRUCK TRAMMING

It was originally planned to use cars on standardized sectional steel tracks for tramming material from the electric shovel to the raises. However, this plan was abandoned when it was realized that a very intricate system of tracks would be involved. There are seven classes of material to be handled in the pit, namely, iron ore, schist ore, converter ore, oxide ore, milling ore, leaching ore, and waste. Any method of disposal had to be so planned as to receive any one of these seven classes of material at any time and at any point and deliver it to any one of the various raises at any particular time. A track layout to take care of the above conditions would have been complicated and impractical, and the idea was abandoned. Seemingly motor trucks offered the only solution to the problem of disposal of material from the electric shovels and still retain the flexibility necessary for this operation.

Four trucks of the aviation type were installed with the first small shovel. The trucks are of $3\frac{1}{2}$ -ton capacity and the bodies are V-bottom, side dump type, which permits the trucks to dump their loads by slightly elevating the outside wheels when driving alongside the raises. The design of the body is a local development and is self-dumping and self-righting. As the work progressed and it was proven that truck tramming was successful, additional equipment was added

until 12 trucks are now in operation. The Moreland six-wheel, four rear wheel drive trucks have proven the most satisfactory and are now standard. The average load carried is approximately 3 cu. yds.

Table V gives the cost of truck tramming and other essential data for the year 1926. The cost per ton of material handled would be approximately one-half the cost per cubic yard, or 9.105 cents per ton. The cost of 8.59 cents per cubic yard for repairs is high, due to the redesigning and reconstruction of truck bodies to the present standards. The number of trucks allotted to a shovel depends on the length of the haul and the condition of the roads.

BREAKING GROUND FOR ELECTRIC SHOVELS

Considerable trouble has been experienced in the lower cuts in breaking hot ground. Vertical machine drill holes can be cooled off by running water into them the same as with churn drill holes. However, cooling toe holes by this method has not been so successful. Temperatures vary from 80° to 400° F., and when toe holes can not be cooled with water, the use of torpedoes is resorted to.

Torpedoes consist of short lengths of $1\frac{1}{4}$ -in. iron pipe, 4 to 8 ft. long, filled with 35 percent gelatin stick powder and one No. 8 electric blasting cap. A torpedo is made up for each hole to be shot and one man is assigned to each torpedo. After the wires are connected up and the blasting warning is given, the men run to shelter and the holes are shot. Fair results are being obtained in this manner. It is obvious that to properly break the ground the holes must be closely spaced. Experiments are now being made with cardboard tubes in place of iron pipes for containing the powder. If these work out satisfactorily, considerable expense will be saved in the cost of the containers and the time required to cut the iron pipes to the proper lengths. In addition, the period of time required for the powder to reach rock temperature may be increased by soaking the tubes in soda alum.

Churn drilling is also being used with satisfactory results in the hot ground where there is no danger of dilution of ore due to the heavier shooting by this method and where the powder charge will not blow back into the old underground workings, since the large diameter hole can be loaded and shot quickly.

GASES PRESENT IN THE PIT

The most serious problem in the pit today is the gaseous fumes being emitted through the ground over the fire zone.

TABLE I.—MACHINE DRILLING AND BLASTING DATA

Purpose used.....	Jackhammer machines	Leyner machines
	Drilling toe holes and plugging.	Drilling vertical slope holes.
Depth drilled.....	18 to 20 ft.	21 to 30 ft.
Feet drilled per hour.....	3.5 ft.	3.7 ft.
Drilling crew.....	1 man	2 men
Labor cost per foot.....	\$0.22	\$0.42
Percent holes lost.....	20%	35%
Spacing of holes.....	6 to 15 ft.	12.5 ft.
Powder charge.....	100 to 250 lbs.	75 to 150 lbs.
Steel used.....	7/8-in. quarter octagon.	1 1/4-in. hollow round.
Gauge of steel, starters.....	2 1/4 in.	2 3/4 in.
Length of steel, starters.....	2 1/2 ft.	2 1/2 ft.
Length of steel, finishers.....	20 ft.	30 ft.
Gauge of steel, finishers.....	1 1/2 in.	1 9/16 in.
Number of changes.....	12	19

TABLE II.—COYOTE BLASTING DATA

Number of pockets.....	Number of Coyote blast					
	1	2	3	4	5	6
Average distance between pockets.....	30 ft.	30 ft.	30 ft.	30 ft.	30 ft.	30 ft.
Total development, drifting and sinking.....	410 ft.	485 ft.	910 ft.	686 ft.	225 ft.	800 ft.
Average distance of pocket to toe of bank.....	78 ft.	100 ft.	133 ft.	65 ft.	61 ft.	100 ft.
Average vertical height above pocket.....	121 ft.	167 ft.	189 ft.	146 ft.	120 ft.	120 ft.
Average height of bank.....	(Pockets under slope only)					
Average burden on each pocket, cu. yds.....	5,000	7,800	9,800	6,000	5,230	9,240
Pounds black powder used.....	100,000	95,400	250,000	.....	.....	.....
Pounds Quarry Special No. 6.....	.....	.....	.....	91,700	.....	200,000
Pounds Quarry Special No. 4.....	.....	.....	.....	.....	45,000	.....
Pounds 60 percent ammonia.....	.....	.....	.....	.....	5,000	30,000
Pounds 50 percent gelatine.....	13,050	8,500	9,900	11,650	.....	3,250
Pounds 35 percent gelatine.....	.....	.....	.....	.....	4,000	.....
Total pounds of powder used.....	113,050	98,900	259,900	103,150	54,000	233,250
Cubic yards broken.....	140,000	135,000	259,000	105,000	54,000	200,000
Cubic yards per pound explosives.....	1.24	1.36	1.00	1.02	1.00	0.86
Cubic yards per foot development.....	394	278	285	153	240	250
Costs: Development, labor, and supplies, cu. yd.....	\$0.0850	\$0.0827	\$0.0502	\$0.1297	\$0.1400	\$0.0407
Explosives per cu. yd.....	0.0783	0.0697	0.0915	0.1065	0.1360	0.1272
Total cost.....	\$0.1633	\$0.1524	\$0.1418	\$0.2362	\$0.2760	\$0.1679

TABLE VII.—EQUIPMENT USED AT UNITED VERDE OPEN-PIT OPERATIONS

No.	Item	Make	Model	Type	Weight, Size, etc.
1	Steam shovel	Marion	300	Full revolving	8 cu. yd. dipper
2	Steam shovels	Osgood	120	Standard	4 cu. yd. dipper
1	Steam shovel	Marion	28	Full revolving	1/4 mounted 2 cu. yd. dipper. Traction
3	Electric shovels	Bucyrus	50B	Full revolving	1 1/4 cu. yd. dipper. Caterpillar
5	Steam locomotives	American	0-6-0	Switcher	82.5 tons
2	Steam locomotives	American	0-4-0	Switcher	53.5 tons
30	Cars	Western		Air dump	25 cu. yds.
1	Spreader	Mann-McCann			14-ft. spread
1	Crane	Browning	30	Traction	100 tons
2	Track shifters	Nordberg	N	Peterson	
3	Churn drills	Keystone	5	Traction	
4	Trucks	Assembled		Aviation	2-3 tons
2	Trucks	Kleiber			5-6 tons
4	Trucks	Moreland	TX-L	6-wheel	10-ton 4-wheel drive

TABLE VIII.—STEAM SHOVEL STRIPPING COSTS, YEAR 1925

MACHINE DRILLING AND BLASTING			STEAM SHOVEL OPERATION		
Item	Cost, cu. yd.		Item	Cost, cu. yd.	
Labor.....	\$0.095		Shovel labor.....	\$0.034	
Explosives.....	0.078		Pit labor.....	0.020	
Supplies.....	0.009		Fuel.....	0.044	
Compressed air.....	0.010		Supplies.....	0.007	
Repairs.....	0.024		Repairs.....	0.108	
Total.....	\$0.216		Total.....	\$0.213	
CHURN DRILLING AND BLASTING			LOCOMOTIVE TRAMMING AND DISPOSAL		
Labor.....	\$0.006		Labor.....	\$0.057	
Explosives.....	0.010		Fuel.....	0.045	
Fuel.....	0.003		Supplies.....	0.005	
Supplies.....	0.002		Locomotive repairs.....	0.020	
Repairs.....	0.003		Car repairs.....	0.031	
Total.....	\$0.024		Track maintenance.....	0.053	
Grand total.....	\$0.240		Dump expense.....	0.049	
			Total.....	\$0.260	
			Grand total.....	\$0.713	

The gas contains a great amount of sulphur dioxide and small amounts of hydrogen sulphide and carbon monoxide. At certain points in the pit it is impossible to work men without gas masks. At times when there is no wind the gas

settles in the pit and working conditions are very disagreeable.

Everything possible has been done by the underground department to seal off the air entering the fire zone and to extinguish the fire. It is now felt that by

TABLE III.—COST OF CHURN DRILLING YEAR 1926

Item	Cost, ft.
Labor.....	\$1.97
Supplies.....	.65
Fuel.....	.68
Repairs.....	.98
Miscellaneous.....	.26
Total.....	\$4.54

TABLE IV.—ELECTRIC SHOVEL OPERATION: COSTS AND DATA—YEAR 1926

COSTS	
Shovel labor.....	5.98 cents per cu. yd.
Pit labor.....	1.36 cents per cu. yd.
Electric power.....	2.13 cents per cu. yd.
Repairs.....	8.26 cents per cu. yd.
Total.....	18.38 cents per cu. yd.

DATA

Electric shovel yardage, year 1926..	274,718 cu. yds.
Cu. yds. per 8-hour shift.....	345 cu. yds.
Power, K. W. H. per cu. yd.....	1.314 cu. yds.
Percent operating delays.....	19.5 percent
Maximum yardage in one shift....	1,110 cu. yds.

TABLE V.—TRUCK TRAMMING: COSTS AND DATA—YEAR 1926

COSTS	
Labor.....	7.10 cents per cu. yd.
Supplies.....	2.52 cents per cu. yd.
Repairs.....	8.59 cents per cu. yd.
Total.....	18.21 cents per cu. yd.

DATA

Cu. yds. per 8-hour truck shift....	102.59 cu. yds.
Cu. yds. per gal. gasoline.....	13.19 cu. yds.
Truck shifts per shovel shift.....	2.83 cu. yds.

TABLE VI.—YARDAGE INVOLVED IN OPEN-PIT OPERATIONS JAN. 1, 1927

STEAM SHOVEL YARDAGE			
	Removed to Jan. 1, '27	Balance remaining	Total yardage
Ore.....	803,354	.....	803,354
Waste.....	6,916,383	252,953	7,169,336
Total.....	7,719,737	252,953	7,972,690
ELECTRIC SHOVEL AND MILL HOLE Y'DAGE			
	Removed to Jan. 1, '27	Balance remaining	Total yardage
Ore.....	230,391	2,145,881	2,376,272
Waste.....	193,106	1,207,174	1,400,280
Total.....	423,497	3,352,055	3,775,552
Grand total.....	8,143,234	3,606,008	11,749,242

sluicing suitable fine material into the cracks and crevices through which the gas is escaping these objectionable working conditions can be eliminated. When tailings are available from the mill a series of experiments will be conducted to determine the efficacy of this method.

MISCELLANEOUS

The yardages involved in the open-pit program are shown in Table VI. It will be noted that the steam shovel work is practically completed and that the future work will be carried on by electric shovels only.

Table VII shows a list of the major equipment used in the open-pit operation.

Table VIII gives the cost of stripping with the steam shovels during the year 1925. A total of 1,818,093 cu. yds. were removed during this period, of which 1,653,009 cu. yds. were waste and the balance ore.

NEW CONCENTRATION PLANT AT UNITED VERDE*

This Plant, Now Under Construction, Is Planned To Treat Daily Through Flotation Process One Thousand Tons Of Low Grade Sulphide And Schist Ores

THE United Verde Copper Co. now has under construction at Clarkdale, Ariz., the first unit of its concentrator for the beneficiation of its low-grade sulphide and schist ores. Experimental work was undertaken in 1924, a considerable tonnage of representative ore being shipped to the mill of the Southwest Metals Co., at Humboldt, for testing on a mill-tonnage basis. There a satisfactory recovery was indi-

By JOHN E. LANNING†

cated, using a straight flotation process after fine grinding. W. N. Rossberg, manager of the Timber Butte Milling Co., at Butte, Mont., was in charge of the test work. The average ratio of concentration was 2% to 1, with a recovery of 93% percent, producing a concentrate assaying 11½ percent copper, by bulk flotation. Later some of the ore was treated by selective flotation, but the test was inconclusive, owing to the small tonnage available. Full tonnage tests after the concentrator is in operation will be necessary to determine this point definitely, so provision for making these tests

is made in the equipment and arrangement of the plant.

Active work on the plans was begun under my direction in August, 1925, subject to the supervision and in the office of the consulting engineer, H. Kenyon Burch, at Los Angeles.

The present smelting plant of the United Verde Copper Co. has been in successful operation for several years, and a complete crushing plant for the reverberatory charge was added in 1923. An important problem was presented by the necessity of perfecting the coordination and arrangement of the concentrator as an accessory to the smelter and crushing plant, with regard for accessibility, flexibility, and ease of future extension and development of both existing equipment and the proposed concentrator. In addition the usual problems of material and equipment handling had to be met.

The mill site selected, immediately above the present crushing plant high line, lends itself admirably to future extension and leaves all space in the present smelter yard free for such extension and modification as may develop. Space is available for the extension of the full section of the mill and bin, as well as thickeners; also for possible future re-grinding between the present flotation and thickening sections.

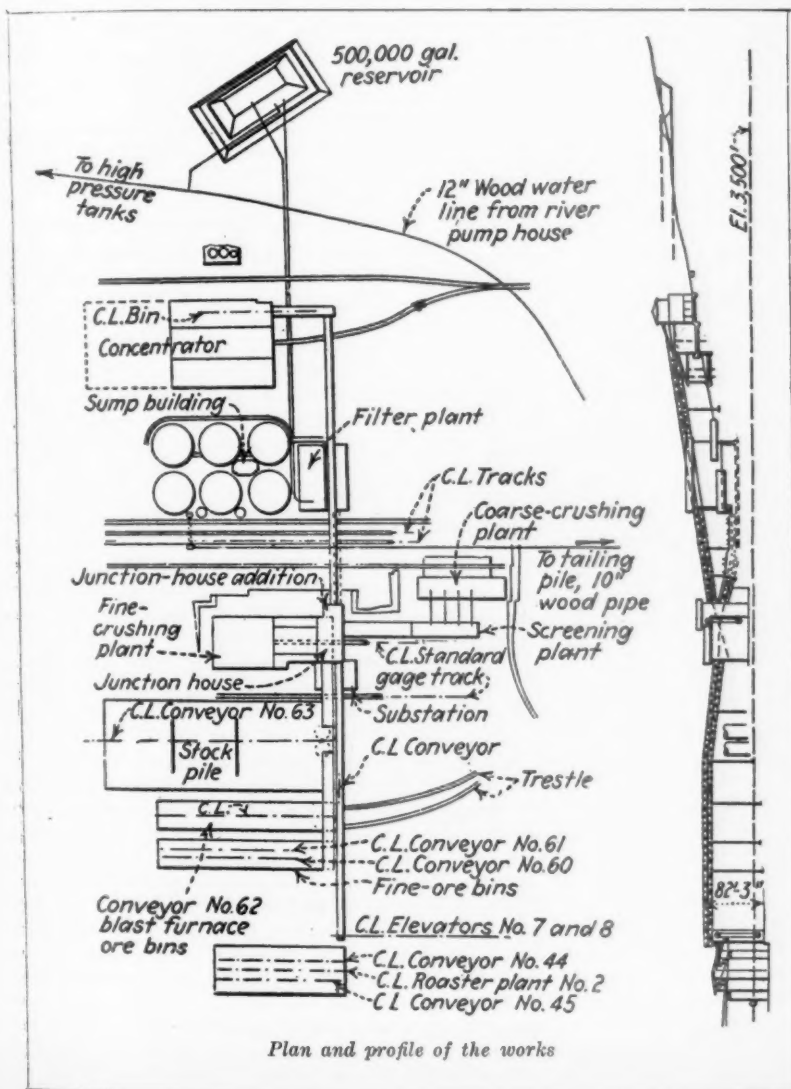
The present crushing equipment makes a minus 3-mesh finished product, and the arrangement of conveyors between the coarse and fine-crushing plants is readily adaptable to the introduction of the concentrator conveyor system to take this feed. All present conveyors pass through a main junction house which will switch conveyor feed in any desired direction. An addition to this building is provided for handling concentrator ores and concentrates.

The coarse-crushing plant delivers to a coarse-screening plant, which makes a separation at 3 mesh. The plus 3-mesh material goes to the fine-crushing plant, or intermediate storage, from which it is later received at the junction house over a 30-in. conveyor, after further reduction to minus 3 mesh. At the head of this conveyor, in the junction house, a diverting chute is provided to deliver to the new 36-in. conveyor, No. 74, the first unit of the concentrator conveyor system. The minus 3-mesh product from the coarse-screening plant also is diverted at the junction house, being elevated by a belt elevator to a sufficient height for delivery to the No. 74 conveyor. Thus by the introduction of two diverting chutes, the crushing-plant

* Paper presented to Annual Meeting, Arizona Chapter, The American Mining Congress, March 14, 1927.

† First article on this mill presented by Eng. & Mng. Jrl., December, 1926.

† Chief Mechanical Engineer, United Verde Copper Co., Clarkdale, Ariz.



Plan and profile of the works

product, be it smelting or concentrating ore, may be sent to its proper fine storage, without in any way complicating the present conveyor system.

The No. 74 conveyor, having a rated capacity of 500 tons per hour and passing over the present high-line receiving bin track and the filter plant, is equipped with a weightometer and delivers to another 36-in. conveyor on the center line of the mill bin, into which the ore is delivered by a special double-spout motor-driven self-reversing tripper.

LARGE ORE STORAGE CAPACITY REQUIRED

The use of the same crushing plant for both concentrating and smelting ores, alternately every second or third day, requires large storage for each class of ore after crushing. The smelter storage is ample, as the actual volume of smelter feed is reduced by the introduction of the concentrator into the circuit, but the 6,000-ton mill bin is unusually large for the size of the concentrator unit. Segregation of smelting and concentrating ores is made at the mine bins, and each class is delivered to the crushing plant in lots sufficient for a shift or a day's run.

The mill bin is 40 by 132 ft. in plan, and 32 ft. from floor to tripper belt line, with a full-length partition on the center line for separation of special lots of ore if desired. The bin is of steel construction, with curved side plates and flat bottom, the main side columns being spaced 22 ft. on center. Intermediate columns supporting the steel floor system are spaced 11 ft. on center, in rows 10 ft. apart.

Ore is drawn from the bin by a series of roll feeders, arranged in four rows and spaced 5 ft. 6 in. apart. Twenty-four feeders in each row deliver to collecting belt conveyors, two of which in turn deliver to each weightometer conveyor to the grinding mills. The feeders are 10 in. in diameter by 12-in. face, and have a speed range from approximately one-half to two revolutions per minute. The two rows of feeders for each mill are driven by one line shaft and a variable-speed motor with control at the weightometer platform, so that, once the feeders are properly set, the mill operator can control the mill feed tonnage from that point. Collecting belts and weightometer belts are driven by constant-speed motors, no variation in speed being required. The two rows of feeders for each mill are placed one on each side of the longitudinal bin partition so that any special ores may be delivered to either of the two grinding units, and provision is made for cutting off the power from either row completely, or from each individual feeder.

This arrangement of feeders, 96 in all,



Mill building, looking toward the north

will insure an even, uniform draft from the entire area of the bin, and a special automatic trip control on the conveyor tripper will give a thoroughly mixed bed, with the least amount of manual control, with its many attendant evils.

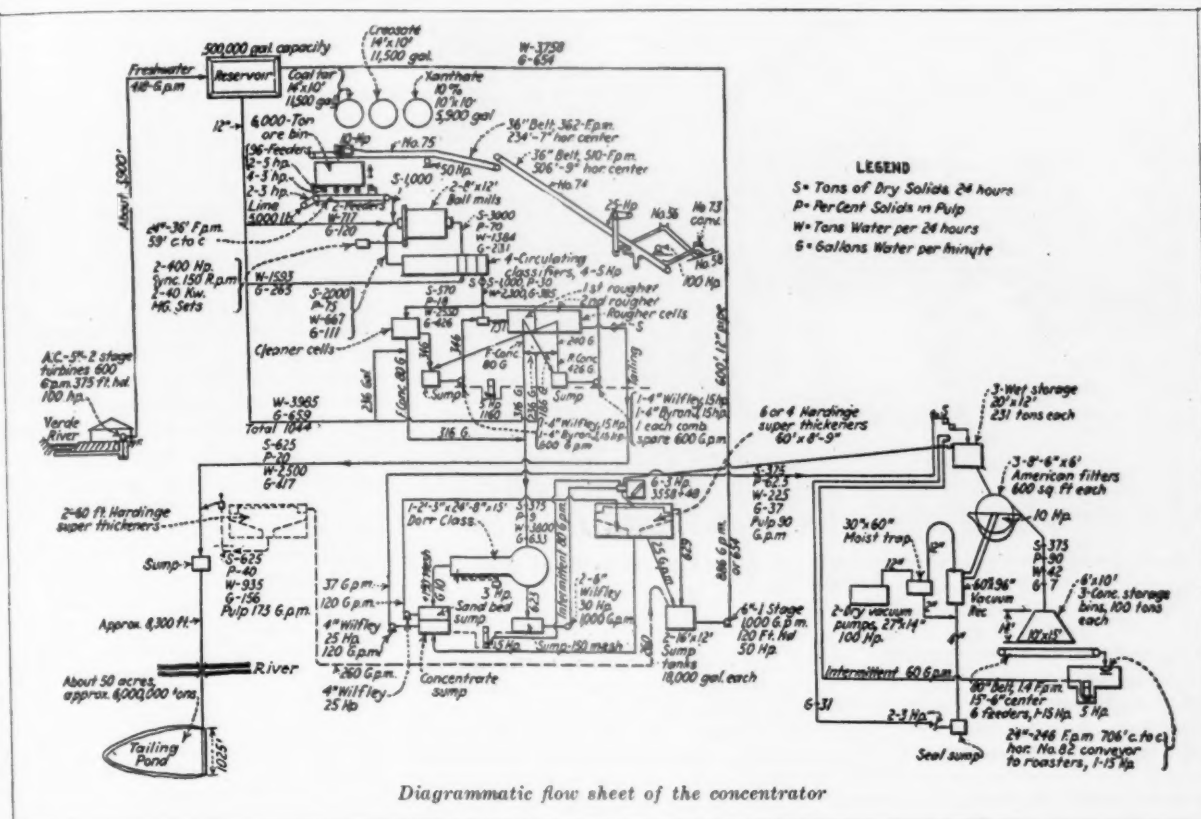
DETAILS OF THE TWO GRINDING MILLS

The two 8 ft. diameter by 12 ft. long cylindrical ball mills are direct connected to slow-speed 400-h. p. internal-clutch synchronous motors, and will have a capacity of from 500 to 800 tons per day from 3 mesh to 100 mesh. They are of especially sturdy construction, with cast-steel heads and plate-steel shells. The 28 by 18 in. trunnion bearing housings, caps and bases are of cast steel, and all parts are amply proportioned for long life and minimum wear and replacement. Steel-cut spur gears and tool-steel pinions insure lasting service and smooth operation. Provision is made for varying speeds, from 14 to 20 revolutions, by changing the pinion so that full advantage can be taken of changes in demand, hardness, and grade of ore, or developments in grinding media and methods. The mills will be operated at 14 r. p. m. at first. Shell liners are of special wave type design in chilled iron, approximately 14 by 28 by 4¼ in. maximum thickness, and each is held by two countersunk head bolts 1½ in. diameter. End liners are 2½ in. thick. Each shell has two manholes 15 by 30 in., with cast-steel covers, easily removable for relining the mill. The discharge trunnion is 16 in. inside diameter, giving ample access to the mill for inspection without removing the manholes. Scoop feeders are of special four-way type for elevating the classifier return to a stationary chute which also feeds the original dry ore into the cone-shaped trunnion liner. These four-way scoops are fitted with renewable hard-iron tips, and are bolted to the cast-steel scoop plate, revolving with the mill. The scooping radius is 60 in. The scoop box is of concrete, with a semi-circular steel drip-proof cover.

In closed circuit with each mill are two steel tank duplex classifiers 8 by 30 ft., set at 3¼-in. slope, and discharging their sand into gravity launders with a 4-in. minimum slope to the scoop box. These launders are of two-compartment type for each classifier, the minimum slope taking all the additional fresh water with the sand from the outside rake, whereas the launder from the inside rake has a 5½-in. slope and will require no additional water. Each classifier is belted to its own motor, with electrical interlock to the mill motor.

Four minerals separation subaeration flotation machines, of sixteen 24-in. impellers each, are arranged in pairs, for either series or parallel operation. Each machine is driven by a 75-h. p. motor with short-center belted drive, and two low-pressure blowers are provided, either of which will supply all four machines with necessary air, the other being held in reserve. Two groups of circulating pumps are provided, each consisting of three pumps, of which one pump is spare equipment and one each is used for middling and cleaner tailing. These pumps are all direct connected to individual motors, with separate control equipment. Thus, complete flexibility and reliability are assured. The pump room is in a basement immediately below the flotation floor, and space is provided for future additional equipment in the present construction program.

The overflow from all of the classifiers will be brought to a common point for sampling and distribution to the flotation machines. Similarly, flotation tailings and concentrates will go to common points, so that three automatic samplers will suffice for the entire mill sampling in ordinary operation. An additional automatic sampler is provided at the filter plant ahead of the wet concentrate storage above the filters. Additional samplers are provided in the concentrator to take care of any special lot sampling, should the two mills be running on different ores at the same time.



NEW TYPE OF THICKENER ADOPTED

The concentrate thickening plant consists of 60-ft. superthickeners with necessary pumps for delivering the concentrate to the thickeners and delivering the thickened product to the filter plant. The superthickener is a recent development in thickening practice and has been described fully in mining publications within the last few months. It requires a filter bed which, in the case of concentrate, must be made of the material being thickened. This material will be provided by making a separation of the flotation concentrate in a bowl classifier, and it is probable that this separation will be continued as a regular operating process so as to relieve the thickeners as much as possible of the coarser material in the concentrate.

The flow of the concentrate at the thickening plant will be as follows: Assuming a separation at 150 mesh, the plus material will go direct to the pump sump, and all below that size will be pumped to the thickeners and after thickening will join with the plus material for pumping to the filter plant. The separation unit and necessary pumps are installed in a sump building at a convenient place in the thickener group, so that handling of materials is reduced to a minimum.

Concentrate handling at the filter plant is complicated by the fact that delivery

of filtered concentrate should be made to the roaster plant only one shift per day. To accomplish this, storage of thickened concentrate has been provided immediately above the filters, in addition to storage of the filtered concentrate, immediately following. Ample capacity is provided to accomplish the desired purpose, regardless of the behavior of the concentrate in filtering.

Storage of thickened products above the filters is accomplished in three tanks, 20 ft. in diameter and 12 ft. deep, each supplied with an agitating mechanism. Overflows from these tanks are of sufficient elevation to permit delivering all overflow or excess material directly back to the main thickening tanks.

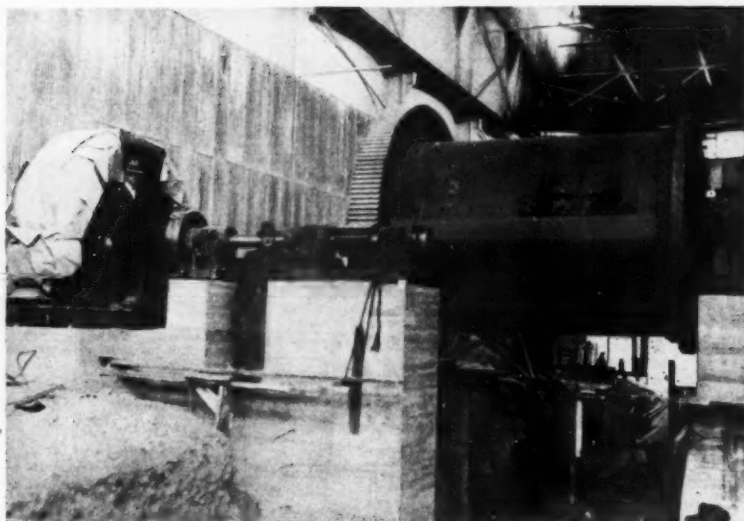
The filters are of the well-known disk type, continuous operating, and will be connected into a common dry vacuum header so that the three filters will be operated by one dry vacuum pump. A spare pump is provided for emergency, and the filtrate will be returned to the reclaimed water system by a centrifugal pump located at a sufficient elevation below the filters to give a complete barometric seal against the dry vacuum pumps.

STORING AND HANDLING CONCENTRATE

Storage of the filtered concentrates is accomplished in three steel bins open at the top and bottom, approximately 6 by 10 ft. at the top and 10 by 15 ft. at the

bottom, and 14 ft. high. The bottom consists of two specially designed pan feeders having a supporting capacity of 1 ton per square foot. The feeders will have a speed of approximately 1.4 ft. per minute and will feed the concentrates out of the bin. They run across the bin and are 6 ft. wide by 10 ft. long, the space between them being covered with a steel-plate "tent" about 2 ft. wide and 4 ft. high, built integrally with the bin. Running over the feeder and supported by it is a rubber belt 80 in. wide, to provide a smooth scraping surface for the removal of the concentrate. The feeders are driven by belts from clutch pulleys on a common line shaft, the motor for which has a variable-speed adjustment that can be operated from the head end of the concentrate conveyor, at the roaster plant, 750 ft. distant. Thus the rate of feed of concentrate to the roaster bins can be controlled by the roaster conveyor operator.

On account of lack of space for making repairs on the feeders in place, they are mounted on wheels so they may be easily pulled out from under the bins for repairs and adjustment. Discharge gates on the bin are adjustable at from 2 to 6 in. above the feeder belt, to regulate the rate of discharge of concentrate. The bins have a capacity of 100 tons each and are made larger at the bottom than at the top, to reduce the tendency of the concentrate to "hang up" on the bin



The 8 by 12-ft. ball mill driven by a 400-h. p. synchronous motor through an internal clutch

walls. All rivets in the bin plates will be countersunk flush on the inside.

The concentrate conveyor is 24 in. wide, 706 ft. centers, and has a capacity of about 60 tons per hour. It crosses below the crusher high-line tracks, runs on an incline through the junction house extension, where its motor is installed, and continues on across the smelter yard to the roaster feeder conveyor system as now installed. At present ore comes to this system from two bucket elevators, and the concentrate conveyor is carried above these elevators, discharging into the ore stream as delivered from the elevators. This will minimize the sticking of the concentrate in the roaster bins by mixing it with the dry ore. A weightometer near the filter plant indicates and records the tonnage of concentrate handled.

Overflow water from the thickening tanks will be returned direct to the 500,000-gal. reservoir on the hillside above the concentrator. The centrifugal return water pumps are direct connected to individual motors, the control of which is fully automatic by float switches. Two pumps are provided; each will have sufficient capacity for the present installation. The pumping head is approximately 120 ft. and the pumps are rated at 1,000 gal. per minute. Delivery of water is made direct to the reservoir to insure a thorough mixture of raw and used water. No attempt is to be made at present to recover all possible water from the tailing, although the tailing can be delivered to the lower bank of thickener tanks by gravity, should they be available. Recent experience in concentrate thickening indicates that considerable of the present tank capacity will be available for tailing, owing to the use of new flotation reagents.

TAILING CONVEYED ALMOST 2 MILES

A wood-stave pipe line will conduct tailing approximately 9,000 feet to a distributing launder approximately 1,000 feet long, with a maximum height of 53 feet. The pipe line has a hydraulic gradient of 2 percent and an inverted siphon of approximately 60 ft. depth, where the line crosses the Verde River. Tailing area available amounts to approximately 50 acres and will provide for 6,000,000 tons of tailing without pumping.

Three-phase 60-cycle power is brought to the present crushing plant but at 2,300 volts from the smelter power house, a distance of about 1,800 ft. across the smelter yard, in underground conduit, the concentrator and crushing plant being tied to a common bus to take full advantage of the power factor correction afforded by the 400-h. p. synchronous mill motors.

All motors will operate at either 2,200 or 440 volts, with full automatic starting equipment, controlled by push button,

with the exception of some small 3 and 5 h. p. motors having manual safety-type switches instead of magnetic. Necessary totalizing and distribution meters are provided to give a complete record of power consumption and distribution for accounting and record information. The grinding-mill motors will be equipped with curve-drawing instruments giving a complete record of grinding power at all times. At a central distributing point 440-volt power transformers will be installed, plant lighting being taken from these transformers also. An emergency-light source will be supplied, with easy switching facilities should the regular lighting circuit be interrupted.

ELECTRIC INTERLOCK PREVENTS SPILLAGE

Each conveyor or other handling system is provided with an electric interlock to prevent the delivery of ore or concentrate to any unit after it has stopped. Thus, should the power be cut off from one of the mill motors, both the conveyor system delivering to that mill and the classifier returning sand to the mill will stop. Stopping the concentrate conveyor at the roaster plant will stop the feeders delivering concentrate to it. This is an especially important feature for ease and cleanliness of operation, covering, as it does, not only the stopping but also the starting of the equipment in proper sequence. All starting buttons will be at the machines to be started, and every precaution will be taken for the safety of workmen or attendants while engaged in necessary repair or adjustment.

Storage and handling tanks are provided for liquid reagents, immediately above the concentrator high line, and two bucket-type feeders are arranged on the mill operating platform in the grinding section. The two mill feeder conveyors are extended beyond the outside line of the mill bin, to accommodate dry-lime feeders, and a crushing and handling plant will be installed for lime or other alkaline reagents. Frothing agents will be added as required below the classifiers.

(Continued on page 314)

Equipment		Manufacturer and address	
Ball mills.....	Special design.....	Llewellyn Iron Works, Los Angeles	
Classifiers.....		Dorr Company, Denver	
Flotation machines.....	Subaeration type.....	Minerals Separation N. A. Corporation, San Francisco	
Blowers.....		P. H. & F. M. Roots Co., Connersville, Ind.	
Thickeners.....	Hardinge super thickeners..	York, Pa.	
Suction pumps.....		Dorr Company, Denver	
Filters.....	American disk filters.....	United Filters Corporation, Hazelton, Pa.	
Electrical equipment.....		Westinghouse Electric & Manufacturing Co., Pittsburgh	
Conveyors and transmission; ball-bearing idlers.....		Stephens-Adamson Mfg. Co., Aurora, Ill.	
Short-center drives.....		Link-Belt Meese & Gottfried Co., San Francisco	
Ore feeders.....	Roll type, special design....	United Verde foundry	
Concentrate feeders.....	Roll type, special design....	Stephens-Adamson Mfg. Co., Aurora, Ill.	
		New York Belting & Packing Co., El Paso	
		Gutta Percha & Rubber Mfg. Co., Salt Lake City	
Conveyor belts.....		United States Rubber Co., Los Angeles	
		Goodyear Tire & Rubber Co., Los Angeles	
		B. F. Goodrich Rubber Co., Los Angeles	
Weightometers.....		Merrick Scale Co., Passaic, N. J.	
Concentrate pumps.....		Wilfley & Sons Co., Denver	
Concentrate pumps.....	Rubber lined.....	Byron Jackson Pump Co., San Francisco	
Centrifugal pumps.....	Return water.....	De Laval Steam Turbine Co., Trenton, N. J.	
Fresh water.....		Allis-Chalmers Mfg. Co., Milwaukee	
Cranes.....		Northern Engineering Co., Detroit	
		Chisholm Moore Mfg. Co., Cleveland	
Wood-stave pipe.....		Pacific Tank & Pipe Co., Los Angeles	

SHAFT CONSTRUCTION METHODS AT UNITED VERDE*

Plain Concrete Lining And Reinforced Concrete Rings Feature Shaft Construction In The Number Five And Number Six Main Shafts And In The New Air Raise Which Is Now Nearing Completion

At the present time there are two main shafts; No. 5, the ore-hoisting shaft, and No. 6, which handles the men and material used in the operation of the mine. There is also an air shaft nearing completion, through which fresh air will be supplied to the main fan, located on the 1,000 level. Descriptions of each shaft and the methods used in construction are as follows:

No. 5 SHAFT

This shaft has two 5 by 5-ft. skip compartments and a 5 by 5-ft. manway, with 10-in. walls separating the compartments. The lining is plain concrete with sufficient reinforcing in the walls to give the required support to the guide castings. The castings are placed on 5-ft. centers in the upper section of the shaft, and on 6-ft. 8-in. centers in the lower section. Fiber conduits were placed in the end of the manway for electric cables and wires. However, in the new section the wires are suspended on the face of the wall as ducts become plugged and give considerable trouble.

When the first section of the shaft was concreted, steel forms were used. Five years later, however, the forms were built of 3 by 3-in. studding on 1-in. lining boards, the shaft timbers being removed as concreting advanced. In 1926, when the shaft was sunk from the 2,400 to the 3,150 level, the timbers were placed so the outside of the wall and end plates would conform to the finished face of the concrete. The center dividers were placed so one face would conform to a partition wall. When sinking was finished, wood panels were placed flush with the outside of shaft timbers and guide bolt castings set to line. The vertical distance between castings was kept uniform by the use of $\frac{3}{4}$ by $1\frac{1}{2}$ -in. templates, while plumb bob lines were used to line the timbers and castings horizontally.

The permanent concrete mixing plant is located below the floor of the 500 level station at No. 6 shaft, and concrete for No. 5 shaft previous to this year was transported from No. 6 shaft to No. 5 shaft in cars, causing considerable delay in handling. It was decided to install a concrete receiver at No. 6 shaft on the 2,400 level and move the concrete through a 6-in. pipe 464 ft. to No. 5 shaft, thence down a 4-in. pipe to the forms by means

By W. J. FLOOD†

of compressed air. Concrete was placed at the rate of 30 to 40 sacks per hour and no serious delays occurred, although the distance from the mixer to the 3,150 level was about 3,100 feet.

There was an appreciable separation of the gravel from the concrete as the mixture was discharged from the receiver, but this defect was remedied by placing a remixing hopper at the 2,550 level station with the result that when deposited in the forms it was well mixed.

When the air gauge at the concrete receiver showed 80 to 90 pounds pressure, two batches were sent at one time; when the pressure was greater than this, three batches were delivered. Bends instead of L's and Y's were used in the 6-in. horizontal pipe line leading from the receiver over to No. 5 shaft. The bends located near the receiver were replaced only once, while the bend located 50 feet from the discharge was renewed six times.

Two sets of forms were used and concreting progressed at the rate of 200 ft. per month in the straight shaft. Two large ore-loading pockets and four waste pockets were constructed and the concreting was completed in less than five months.

Twenty-one men made up the crews; 18 shaft miners, 2 mixer men and 1 man at the receiver. The total cost per cubic yard was about \$22.50.

About six months ago it became necessary to repair the upper or old section of the shaft, due to the excessive wear on the guides and concrete walls from falling rock. The worn concrete walls of the shaft were built up with successive layers of gunite, which was quickly and successfully accomplished. In order to obtain a satisfactory bond it was necessary to first sand blast the old wall. The worn Oregon pine guides from the 2,400 level to the 1,800 level were replaced by 4 by 8-in. ship channel steel guides. Above the 1,800 level, where the wear is not so excessive, the old wood guides are repaired by screwing $\frac{1}{2}$ -in. or $\frac{3}{4}$ -in. thick maple inlay to the worn side of the guides.

A steel rock deflector is located at the 1,950 level station and is closed when ore is being hoisted from skip pockets above. This deflector is under remote electrical control in the hoist room and deflects all spillage to the 2,100 level ore pockets.

No. 6 SHAFT

No. 6 shaft is 13 by 13 ft. inside, with one main compartment 8 by 13 ft., one pipe compartment and a counterweight compartment. From the 400 level to the 1,950 level this shaft was concreted solid with a 10-in. curtain wall between the main compartment and the smaller compartments, and a similar curtain wall between the pipe and counterweight compartments.

The shaft was first raised from one level to the next, using a double-cribbed manway and, when ready for concreting, muck was drawn down 20 to 50 ft., sills and square sets and forms placed, and concrete poured. This operation was repeated, followed by the stripping of forms and square sets. The method was slow and costly, therefore when the management was ready to construct this shaft from the 1,950 level to the 2,400 level, three plans were considered; first, steel shaft sets; second, precast reinforced concrete shaft sets; and third, reinforced concrete rings. After considering the cost and method of construction of each plan, it was decided to use the concrete rings. Preliminary to the adoption of the ring method and to determine the weight necessary to shear a slab of concrete from a smooth wall, a slab of concrete 2 ft. 6 in. high, 13 ft. long, and 8 in. thick was cast on a smooth wall previously cleaned. At the end of four days the forms were stripped and the unsupported slab loaded with $3\frac{1}{2}$ tons of drill steel. As there was no sign of failure, it was evident that the rings and forms would be self-supporting if five sets of forms were used and one set poured every 24 hours. The principal difficulty of providing a foundation on which to place the forms was met by using a base ring made of four 4 by 10's 14 ft. 2 in. long, framed similar to a wall plate. These were supported by 16 hangers suspended from the next set above. These hangers have a hook at the top which fits a hole in the bottom 3 by 3-in. L of the form above, and a 1-in. turnbuckle in the center for levelling the forms, and a boot 10 in. long at the lower end upon which the base ring is laid. The base ring is then brought to line by temporarily tacking a sprag to the ring with one end against the rock at each corner of the shaft. A 1 by 6-in. ship lap is then laid at right angles to the rock face with one end scribed to fit the irregular rock face and the other end fastened to the 4 by 10's with one 6d nail. Men were furnished lather's

* Paper presented to Annual Meeting, Arizona Chapter, The American Mining Congress, March 14-15, 1927.

† Mine Foreman, United Verde Copper Co., Jerome, Ariz.

hatchets and short saws. If the rock wall was over 2 ft. away from the forms, the ends of the ship lap were supported by props from below. The reinforcing steel was fabricated in the shops by spot welding the six $\frac{3}{4}$ -in. horizontals to the $\frac{3}{4}$ -in. vertical steel, and the four sections were placed in position on the sill and the lapped ends wired.

The eight sections of steel form were then lowered from the top or fifth ring, placed on the sill, and fastened by pins to the base ring. Corners were fastened on top with gusset plates and 2 by 2 angle braces kept the forms square. Two 3 by 4-in. angles at right angles to each other brace the top centers of forms and are also used to support staging planks. The bottom of the forms, pinned to the base ring, is rigid enough so that no cross

Method	Feet	Excavation per ft.	Concrete per ft.	Total per ft.
Solid	1,550	\$68.17	\$148.84	\$216.01
Ring	450	77.11	50.11	127.22
Saving per foot				\$87.79

DETAILED COSTS FOR RING METHOD

	Excavation		Concreting	
	Amount	Per ft.	Amount	Per ft.
Labor	\$22,449.15	\$52.07	\$7,459.28	\$16.60
Shops	117.04	0.26	2,663.58	5.90
Supplies	3,311.10	7.68	11,941.01	26.51
Engineers			475.66	1.05
Explosives	3,750.86	8.47		
Air	870.42	2.08		
Repairs	2,815.91	6.55		
Miscellaneous			20.00	0.05
	\$33,314.48	\$77.11	\$22,559.53	\$50.11

Cost per yard of concrete poured—Ring method—\$61.30—Mix 1:2:4.
Solid method—58.80—Mix 1:3:5.

bracing is needed since the concrete does not spring the forms more than a fraction of an inch.

Concrete is delivered through a 5-in.

pipe from the mixing plant on the 500 level to a remixing hopper placed on the station immediately above the new section of shaft and then connected to a bucket above the forms through a 4-in. pipe. As each ring is finished, the muck is drawn and cribbing stripped, affording a safe working place at all times. The 12-in. and 8-in. I-beam dividers and steel ladders are placed and bolted to anchor bolts which are previously set in concrete as rings are poured. A heavy 2-in. mesh wire netting fastened to the I-beams separates the various compartments and prevents anyone in the manway from getting a portion of his body into the main or counterweight compartment.

The costs of the completed shaft, including steel dividers, etc., is about 40 percent cheaper than the old solid section, and there is about the same saving in time. The tabulation above indicates the saving by the ring method. (Continued on page 314)

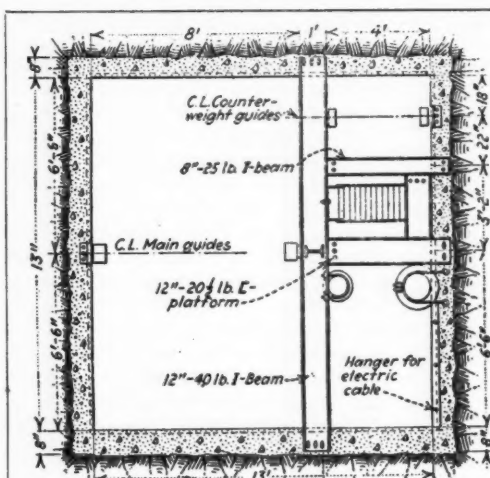
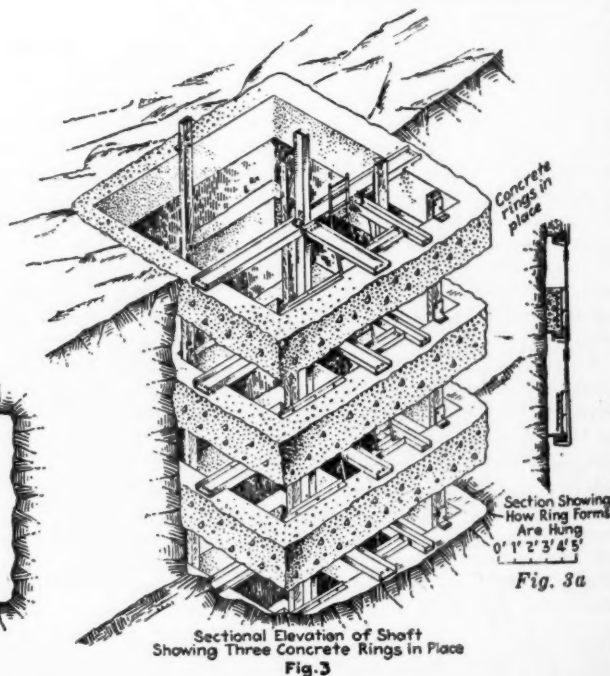
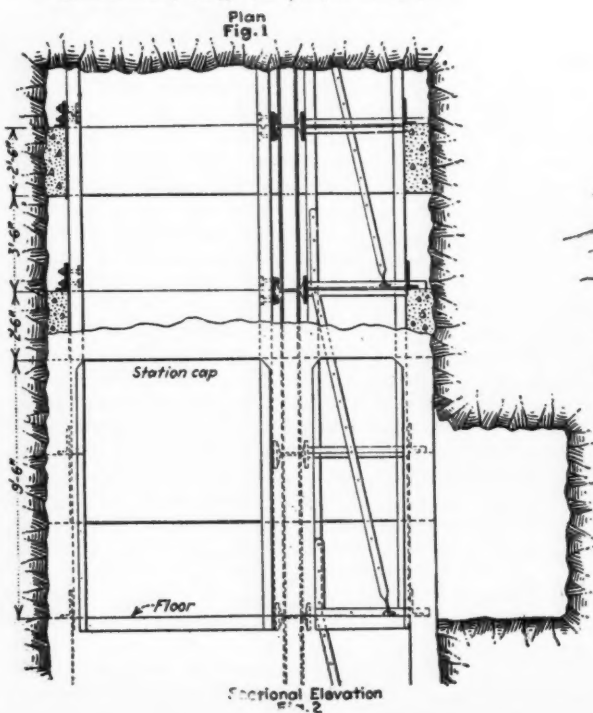


Fig. 1. Plan of man or material shaft.

Fig. 2. Section of man or material shaft.

Fig. 3. Concrete rings in place.

Fig. 3a. Section showing how ring forms are hung.





COAL

PRACTICAL OPERATING MEN'S DEPARTMENT

NEWELL G. ALFORD, Editor

*Practical Operating Problems of the
Coal Mining Industry*



MECHANICAL LOADING IN NARROW WORK

Results Obtained During A Six-Month Period Indicate Cost Of Machine Loading High As Hand Loading, But Advantage Of Rapid Development Heavily Overbalances Cost—They Also Indicate That Conveyors Have Come To Stay Whether Fed By Hand Or Mechanical Means

THE mines of the Norton Coal Mining Co. are located in Hopkins County in the Western Kentucky coal field.

While experimenting with conveyor loading on long faces, in the No. 1 mine at Nortonville, it was quickly demonstrated that a much more rapid system of driving narrow work had to be employed in order to develop new faces as fast as the working territory was exhausted.

Narrow work had formerly been driven with shortwall machines with 6-ft. bars, which gave an advance of only one cut of 6 ft. per day to each place. Faces were being driven on 135-ft. centers for a depth of 200 ft. and slabbed out to 100 ft. As it only took about one month to work out one block the problem therefore was to drive each entry the distance between centers, plus the depth of the face, or a total of 335 ft. every month. This condition was met by the installation of Jeffrey Shortwaloaders.

The first of these

By STERLING S. LANIER, JR.*

machines was installed in October, 1925, and put in operation in the No. 9 seam, which at Nortonville averages 4 ft. 8 in. in thickness, has a good strong slate roof and a hard fire clay bottom. The Shortwaloader is what its name implies—a combination of a shortwall mining machine and a coal loader. It is equipped with three cutter bars. The bottom bar undercuts exactly as with a shortwall, before which operation the two upper bars, which are pivoted, must be swung back in a horizontal plane to the rear.

After the cut has been made, the coal is shot down and the machine then sumps in again, this time with all three bars. The bits drag the coal back to a conveyor which discharges onto a second swinging conveyor. This in turn discharges into a sectional conveyor which carries the coal back to a side track, containing a trip of sufficient cars to clean up the fall. The machine advances a distance of 300 ft. before the track is moved up behind it.

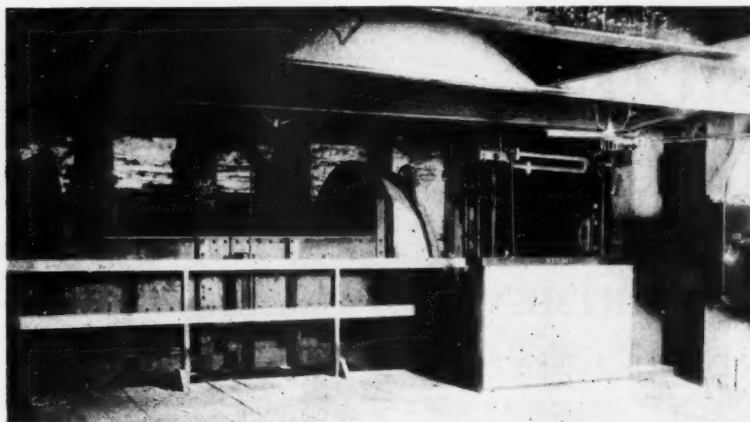
Ventilation is carried by means of a small fan blowing through tubing. Canvas tubing was first used for this, but has since been replaced by wooden boxes built in 6-ft. sections.

At first a locomotive was used to spot cars under the discharge end of the sectional conveyor. This was later replaced by a small hoist, the starting rheostat for which was placed next to the starter for the sectional conveyor, where one man could operate both and load the cars, thus saving one man and substituting an inexpensive hoist for a gathering loco-



Track steel tippie in course of erection at new Crabtree Slope. Development entries are being driven in this mine mechanically

* General manager, Norton Coal Mining Company, Nortonville, Ky.



Rotary dump and steel and concrete bottom in new Crabtree Slope. Rapid development is being obtained at this mine by use of entry-driving machines

motive, which was released for haulage work elsewhere.

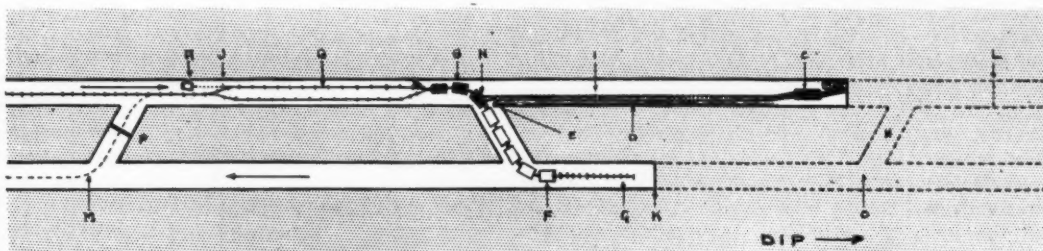
The crew consists of one machine runner, three helpers, and one conveyor and hoist operator. The three helpers assist in the operation of the machine, do the drilling and shooting, and put on advance sections of conveyor, and ventilation tubing.

Only after several months of operation, did the crew on the first machine get their individual duties so coordinated as to cut loss of time to the minimum. During this period an average of three falls per shift of 8 hours was obtained, giving an advance of 15 ft. per shift. The tendency during this time was to hold the entry wider than was desired, frequently getting out to 18 ft. A green crew will invariably do this unless very closely watched. Later, 12 to 14-ft.



Mechanical loader discharging into sectional conveyor in Mine No. 1 at Nortonville, Kentucky

The distance from J to L is the same as that of M and O, also the cross cut spacing is governed by the same factor, which is the maximum length of the conveyor I, from the loading point N, to the entry driving machine C



SHORTWALODER DRIVING PARALLEL HEADINGS
In the case of a dip entry

- | | |
|---|----------------------------|
| a. Hoist. | j. Past idle face. |
| b. Loaded cars. | k. Present idle face. |
| c. Entry driving machine. | l. Future idle face. |
| d. Ventilating tube. | m. Past loading points. |
| e. Blower. | n. Present loading points. |
| f. Empty cars. | o. Future loading points. |
| g. Track for empty cars in stopped heading. | p. Brattice. |
| h. Future cross cut for idle heading. | q. Side track. |
| i. Conveyor. | |

places were maintained, which is about the minimum for the machine.

As sulphur balls occur frequently in Western Kentucky coal, a frequent change of bits is necessary. Where average conditions occur, one setting of bits in the lower bar will last for one cut, but most of these will have to be replaced on the next cut. While the machine is making the undercut, requiring the attention of two men, two of the crew do the drilling and prepare the shots, while the fifth man adds a section onto the main line conveyor. When the cut is completed, which generally takes about 20 minutes, the machine is backed out far enough so that the cutter bar will not be covered with falling coal.

By that time the shots should be ready for firing. If canvas tubing is used, the fan should be shut down before the shot is fired, as otherwise the tube might be cut or blown loose by flying particles of coal. The fan is started promptly after the shots are fired, and the crew immediately return to start the loading operation. The whole cycle may be carried out in something less than an hour, and it would be possible to maintain a pace of one cut per hour, or even better if all haulage delays were eliminated and no other troubles developed, but unfortunately such perfection is not always possible, and a crew that averages five cuts per shift is working smoothly and well.

Height of coal, ease of cutting and width of entry are of course, prime factors in setting the pace. Quality of roof also is important, and if timbering is required another man should be added to the crew. A 4-ft. seam, free of impurities, with a strong roof would probably present the best opportunity for fast yardage.

During a six months' period, which did not include the first three months of operation, the following results were obtained, which are averages from the operation of two machines:

AVERAGES FROM OPERATION OF TWO MACHINES					
Month	Days Worked (Cutting)	Days Moving	One-Man Shifts day labor	Feet of Advance Monthly	Daily
First	16.5	2.5	24.5	406	25.3
Second	15.0	8.0	37.6	382	25.5
Third	10.5	5.5	51.5	228	21.7
Fourth	13.5	7.5	29.3	316	23.5
Fifth	15.0	3.0	17.5	343	22.9
Sixth	14.0	8.0	38.6	332	23.8
Total	84.5	34.5	109.3	2,007	....
Average.....	14	4.8	33.2	334.5	23.9

These results were not obtained until after the crew had been put upon a footage basis. The scale per foot was arrived at by assuming that four cuts per shift, giving 20 ft. of advance, should constitute an ordinary day's work, and then allowing each man the same rate, which was set at the current day rate for machine men, the footage rate being the quotient of two.

The Shortwaloaders have been kept in operation at No. 1 mine, and in developing the new Crabtree mine, and while the cost of the coal loaded by them has been as high as though loaded by hand, the advantage of rapid development heavily overbalances this. These machines permit elimination of 80 percent of the brattices in the entries driven by them, and are particularly well adapted for driving entries where permanent ventilation must be maintained, breakthroughs being spaced 300 ft. apart instead of 60 ft.

Experiments lately made at Nortonville indicate that excellent results may be obtained by the use of a standard



Sumping into a fresh shot place. Only the upper cutter bar is visible in this picture, the two lower bars being covered by coal

shortwall machine operating in two parallel headings in conjunction with hand loading into conveyors. With a crew of two machine men and six loaders, who likewise do the drilling, shooting and

ing applicable to any mine wherein a shortwall machine can be used, whereas the Shortwaloaders can only be used under certain favorable conditions. Where the standard shortwall machine is used however, it will be necessary to either use a caterpillar truck or to cut frequent breakthroughs, which of course, would cut down the amount of advance of the entries in proportion.

The most important conclusion to be drawn from all of the preceding, is that conveyors have come to stay in coal mining work, whether fed by hand loading, or by mechanical means.

conveyor work, and one conveyor operator, each entry should be advanced 18 ft. per shift.

This system has the advantage of be-

CORRECTION

In the article entitled "The Sand Flotation Process for the Cleaning of Anthracite and Bituminous Coals," which appeared in our March issue, the recovery figures for the Enterprise Breaker of the Northumberland Mining Co., under "Refuse—Visual Inspection," on page 211, should have read—

"Large Refuse: Coal, .58 percent; bone, 2.24 percent.

"Small Refuse: Coal, .52 percent; bone, 1.98 percent."

In the March issue this incorrectly appeared—

"Large Refuse: Coal, 58 percent; bone, 2.24 percent.

"Small Refuse: Coal, 52 percent; bone, 1.98 percent."

A cooperative investigation for the purpose of determining some property of coal ash susceptible to reasonably accurate measurement in the laboratory which would serve as an index to its clinkering characteristics in boiler furnaces has been undertaken by Carnegie Institute of Technology and the Bureau of Mines at the request of the Committee on Coal and Coke of the American Society for Testing Materials.

Seven coals, having ash-fusion temperatures ranking from 2,070 to 2,930° F., were selected for comparative burning tests in a specially designed hand-fired furnace with a circular grate 20 inches in diameter and water-cooled iron walls.

The results are outlined in Bulletin 29, Mining and Metallurgical Investigations. Copies of the bulletin may be obtained from Carnegie Institute of Technology, Pittsburgh, Pa., at a price of 50 cents.

TIMBER PRESERVATION AND HOW IT MAY PROFITABLY BE APPLIED TO COAL MINING

Mining Industry Sustains Timber Losses Mainly From Four Agencies: Mechanical Wear, Breakage, Unrecoverable And Decay—Loss From Decay Extremely Heavy And Wholly Avoidable At Reasonable Cost—Experiments Now Being Conducted

By M. E. HAWORTH*

EXPERIMENTATION with wood preservatives in the United States began with the railroads as early as 1875, although the work was not taken up in earnest until just prior to or early in the twentieth century. Coal-tar creosote and zinc chloride comprise the bulk of the preservatives now in use in American mining industry.

European experiments probably had their inception early in the nineteenth century, in the English Navy, coal-tar creosote, zinc chloride and mercuric chloride being used. Sodium fluoride was used in Germany as early as 1898, although preservative treatment did not receive general attention in European mining industry until 1907 and 1908.

Domestic practice is still largely confined to coal-tar creosote and zinc chloride, although other water soluble salts manufactured from foreign formulae are coming into more general use. European practice makes almost universal use of Wolman salts or other water soluble salts containing mixtures of sodium fluoride and nitrated phenols with the addition of arsenic salts and neutral salts.

EXPERIENCE OF OTHER INDUSTRIES

During the years 1909 and 1910 the Chicago, Burlington & Quincy Railroad placed 13,870 treated ties of various species in experimental tracks on lines east, together with 2,040 untreated ties. On lines west 6,888 treated ties were placed in experimental tracks, together with 1,075 untreated ties. Three processes of treatment were applied: straight creosote, card process (creosote and zinc chloride), and Burnettized (straight zinc chloride). The records as of the year 1925 showed replacements on account of decay on lines both east and west as follows:

Straight creosote.....	4.9 percent
Card process.....	11.2 percent
Burnettized.....	29.7 percent
Untreated.....	90.3 percent

Replacements have been made since 1925, but to date no general conclusions can be drawn relative to the effectiveness of the different treatments on the different species of wood.

In the fall of 1914 the Baltimore & Ohio Railroad placed 3,510 red oak ties in experimental track at Herring Run, Md., using four preservatives with pressure treatment: zinc chloride, straight

creosote, straight water-gas tar, and sodium fluoride. At the end of ten years the records show the following replacements on account of decay:

Untreated.....	95.7 percent
Zinc chloride.....	0.3 percent
Coal-tar creosote.....	0.0 percent
Water-gas creosote.....	0.5 percent
Sodium fluoride.....	0.7 percent

Various railroads in the West and Southwest have used various processes of treatment with equally successful results. The Santa Fe Railroad is reported to have reduced the number of annual tie replacements from over 250 ties per mile of track before treatment was instituted in 1900, to 145 ties per mile for the period 1921 to 1923 inclusive, a reduction of over 100 ties per mile of track. Operating over 18,000 miles of railroad, the saving aggregates close to 2,000,000 ties annually.

The American Telephone & Telegraph Co., the New England Telephone & Telegraph Co., the Western Union Telegraph Co., as well as the railroads, have treated poles and wood structures with equally successful results.

TREATMENT IN THE MINING INDUSTRY

The Philadelphia & Reading Coal Co. have had a pressure treating plant near Pottsville, Pa., for a number of years. Their experience is that sodium fluoride treated timbers generally are in good condition at the end of ten years, whereas untreated timbers have an average life of about three years.

The Anaconda Copper Co. have been using both open tank and pressure methods with Minolith, Ac-Zol, Cresol, and other solutions with arsenical salts. The test timbers are as yet too young for observing results.

The Colorado Fuel & Iron Co. built an open tank treating plant in 1922. Creosoted and Ac-Zolated timbers were apparently as good as new at the end of four years and untreated timber so badly decayed as to be a total loss.

The Miami Copper Co. have obtained excellent results with their zinc chloride pressure treating plant and the Cleveland Cliffs Iron Co. have obtained good results from their zinc chloride open tank treatment.

The writer has observed results obtained through the use of coal-tar creosote with single open tank treatment over

a period of ten years. A superficial treatment which gave an absorption of about one-quarter of a gallon of creosote per cubic foot of timber produced unexpected results. An examination of treated and untreated white oak ties placed alternately in a coke pusher track showed the treated ties to be apparently sound at the end of seven years, whereas the untreated ties were soft with decay and practically useless. Experiments are now being conducted with zinc chloride and coal-tar creosote, using both hot and cold open tank treatment. The process approximates the vacuum-pressure system of treatment, and while it is not expected or desired that the quantity of absorption will reach that obtained with the more elaborate pressure systems, it is expected that the absorption will be sufficiently great to extend the life of the timber to the length desired. A thorough pressure treatment can be expected to produce in excess of a 20-year life which, in the majority of cases, is longer than required for mine use. If a 12 to 15 year life can be obtained with an inexpensive treating plant at a nominal treating cost, the more elaborate plant with higher treating costs is unwarranted for use where the life produced by the less expensive process is sufficient.

LOSS OF TIMBER

The mining industry sustains timber losses mainly from four agencies: mechanical wear, breakage, unrecoverable, and decay. Losses in props and other timber by reason of failure to recover same constitute a heavy, and in the majority of cases, unavoidable loss, either by reason of the physical impracticability or the cost of recovery. Decay is responsible for an extremely heavy loss which is almost wholly avoidable at a reasonable cost for preservative treatment.

VALUE OF PRESERVATIVE TREATMENT

Experimentation with various processes of preservative treatment has proven that the life of timber can be extended almost indefinitely against decay, depending upon the completeness with which the treatment is applied. Preservative treatment also reduces losses from mechanical wear and breakage by eliminating the weakening action of decay. As sound timber offers greater resistance to destruction by fire than decayed or partially decayed timber, preservative treatment consequently reduces fire hazards.

* Chief engineer, Hillman Coal & Coke Co., Pittsburgh, Pa.

Where untreated timber has a life of two to three years, treated timber can reasonably be expected to have a life of 6 to 20 years, depending upon the preservative used and the process by which it is applied. Considering the cost of commercial preservatives and the labor cost making the application, even the simplest treatment applied in the most superficial manner prolongs the life against decay to such an extent as to more than warrant the expense incurred.

COMMERCIAL PRESERVATIVES IN COMMON USE

The commercial preservatives more commonly used in domestic and foreign practice include the following:

Coal-tar creosote oils. A product of the distillation of coal derived from the fraction of coal tar distillate which boils between 200° and 300° C. (approximate). Creosote oils contain phenol, cresol, naphthalene, anthracene, etc., and are often sold in their crude state. Some commercial products, however, are carried through various processes of refinement for the removal of substances not desired. Whether coal-tar creosotes increase the inflammability of wood aged somewhat after treatment is a debatable subject. They can hardly be said, however, to tend to make the wood more fire-resisting, although the truth of the matter probably is that the difference between the fire-resisting qualities of the timber before and after treatment is so slight as to make the matter one of little, if any, importance. The more disagreeable quality is encountered by workmen who handle the timber while it is still moist.

Sodium fluoride. A salt soluble only to about 4 percent and having twice the toxic value of coal-tar creosote or zinc chloride.

Zinc chloride. A salt soluble in all proportions and having a toxic value slightly above that of coal-tar creosote.

Wolman salts (*Triolith, Tanalith, and Minolith*). Mixtures of sodium fluoride and nitrated phenols, the nitrated phenols added to supply the toxic properties. Tanalith contains arsenic salts presumably to guard against animal attack, and minolith contains neutral salts for the intended purpose of increasing the fire retarding properties.

Ac-Zol. Composed of ammonia, copper, zinc, and phenol (carbolic acid). Claims are made for it as having exceptional penetrating power and adaptable to open tank and brush treatment.

Basilit. A mixture of sodium fluoride and dinitrophenolalanine with a small amount of zinc salt.

Other preservatives composed of copper and iron salts, sodium fluoride, zinc chloride, etc., or various mixtures of the same, have been placed on the market within recent years, including taneufe,

protexide, Saum's preserver, etc., each manufacturer making special claims for his product as to its toxic value, permanence, application, effect on strength of timber, fire resisting qualities, electric conductivity, etc.

DECAY AND THE TOXIC VALUE OF SUBSTANCES

Decay (both wet and dry rot) is caused by the action of fungi or highly developed parasitical plants which take their sustenance from the wood substance. Wood, not infected by fungi, will last indefinitely, but in order to protect the wood against the attack it must be kept either too dry for fungous growth, completely submerged in water, or treated with a preservative having a toxic value sufficient to inhibit fungous growth, kill insects, etc., and a life that renders it effective against fungous growth for a length of time compatible with the cost of the treatment.

The comparative toxicity values, figured from reciprocals of concentration found necessary in parts per thousand to inhibit fungous growth, according to the United States Forest Products Laboratory, are as follows:

Chemicals:

Common rock salt.....	1
Sulphate of iron.....	5
Sulphate of copper.....	10
Chloride of zinc.....	20
Boric acid.....	50
Sodium fluoride.....	100
Phenol.....	100
Nitrophenolate of sodium.....	2000
Dinitrophenol.....	10000

Wood Preservatives—Commercial:

Coal-tar creosote.....	45-100
Water-gas tar creosote.....	1-25
Anthracene oil.....	12
Wood tar.....	20
Sodium chloride.....	100
Zinc chloride.....	50

NECESSITY FOR PRESERVATIVE TREATMENT

By reason of the depleted areas of forests in close proximity to the mining regions, necessitating long hauls for delivery of timbers to the mines, and by reason of the growing scarcity of timber reserves, the cost of timber products is rapidly mounting higher.

A tabulation of the figures in statistics compiled by the Forest Service, Department of Agriculture, noted below, shows that the cost of round timbers increased more than 200 percent between the years 1905 and 1923 and the cost of sawed timber increased about 100 percent.

QUANTITY AND COST OF TIMBER USED IN BITUMINOUS AND ANTHRACITE MINES OF THE UNITED STATES—1905 AND 1923

Round Timber (Used Underground):			
Year	Cu. ft.	Total Cost	Cost Per cu. ft.
1905	134,985,700	\$7,063,989	\$0.0523
1923	152,342,217	26,088,042	0.1712
Sawed Timber (Used Underground):			
Year	Bd. ft.	Total Cost	Cost Per M bd. ft.
1905	242,000,000	\$2,749,067	\$15.50
1923	296,641,000	8,877,012	29.92

With continuing depletion of reserves and increased requirements for timber in other industries as well as mining, costs will mount still higher, making the matter of preservative treatment imperative as well as greater substitution of other materials for timber.

If the initial cost of the timber were the only consideration, the cost of preservative treatment would return large dividends due to the extended life of treated timber as compared with untreated timber. But when the labor cost of handling and placing the timber is taken into consideration, together with the indirect cost of crippled transportation facilities, short circuited or poor ventilation where timber is used for stoppings, accidents resulting from confidence placed in apparently sound but actually rotted timber or timber greatly weakened by rot, it becomes quite easily apparent that it is expensive economy to ignore preservative treatment.

FACILITIES REQUIRED FOR PRESERVATIVE TREATMENT

Where large corporations have the opportunity for installing a fairly large capacity plant that will serve a group of mines in a certain field or locality, especially long life mines, a larger expenditure in plant is warranted than for an individual mine whose timber requirements are comparatively small. Pressure treating plants have demonstrated that that process applied with any one of a number of commercial preservatives will give timber a 20-year life or longer. In the case of many mines an indefinite life is not required, 10 to 15 years being ample for timber in such use that it will have no salvage value at the end of that time, either through mechanical wear or breakage, or by reason of having been installed in such locations that the labor cost of salvage would be excessive.

Brush treatment has given results that more than warranted the cost of application, but at best it is a superficial treatment and should not be used except where conditions are such as to permit no other treatment.

The writer has great faith in the open tank method, and urges its development and use for several reasons:

1. A complete installation can be made for a total expenditure of \$200 to \$300, providing facilities for treatment that will give the treated timber a life four to five times that of untreated timber, or longer. If a mine plant is not equipped with steam, a small additional expenditure will be required to provide facilities for heating the preservatives to the required temperatures.

2. The life of the timber provided by this treatment can probably reach 15 years or more, depending on the timber and the preservatives used, and the care with which the application is made.

(Continued on page 329)

THE NATION'S VIEWPOINT



AFTER reviewing the facts concerning conditions in the bituminous coal field, *The Wall Street Journal* comes to the conclusion that so far as the march of prosperity in 1927 is concerned, a strike in the union fields should present no serious obstacle. Their editorial follows:

"How will a strike in the bituminous coal mines this spring affect the gen-



© Kansas City Times

Hardly Seems Safe Anywhere Outside the Yard Any More

eral business situation? According to the present stage of developments, suspension by union miners will not have nearly the deterrent force to business activity that was forecast when the strike loomed farther away than it is now. The three-year Jacksonville agreement expires on March 31.

"Negotiations at Miami for a new contract have come to an abrupt halt. Union leaders say the miners are to quit work on April 1 unless some plan of arbitration is advanced and an agreement reached. Operators of the union mines contend for a wage scale that would enable their mines to compete with non-union mines. The miners will not recede from the stand that there shall be no recession from the Jacksonville agreement, and that

any new contract must be based on retention of the basic wage scale of \$7.50 a day.

"It is authoritatively reported, however, that the miners' policy committee has decided that only union mines in the Central Competitive Field will be affected by the strike. This field lies in Ohio, western Pennsylvania, Indiana and Illinois. The decision of the committee is that in the outlying districts mining will continue under the Jacksonville agreement until the dispute in the central field is settled.

"The outlying districts are in Iowa, Missouri, Kansas, Arkansas, Oklahoma, Colorado, Wyoming, Montana, Michigan and Washington. Here about 150,000 union miners are employed. If these miners continue at work, the coal supplies of most of the large railroad systems would be assured, and economic distress caused by the reduced purchasing power of the miners would not be so severe as expected.

"Moreover, although the organization of the United Mine Workers on strike may be considerably stronger than it is at work, there has been a steady falling off in the importance of the union mines. In 1920 the union fields produced about two-thirds of the bituminous coal. On January 1 of this year union production had fallen to

about one-third of the output, and some estimates place the percentage of union production as low as 10 percent on February 15.

"Large stocks of coal on hand will further lessen the effects of a strike. On January 1 stocks in the hands of industrial users and retailers, according to the Bureau of Mines, were 55,000,000 tons, a 37-day supply. This compares with 43,000,000 tons on October 1, and 49,000,000 on January 1,



The Cincinnati Enquirer

That Hound's Raided the Hencoop Again

1926. Production and consumption figures since January 1 show that stocks have increased since then."

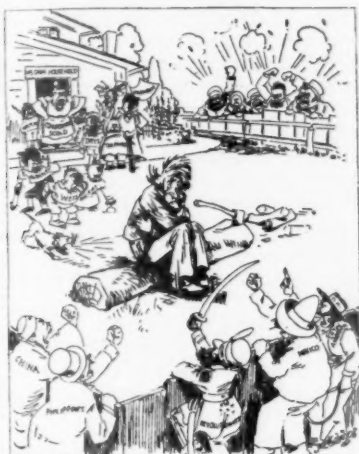
The American Metal Market agrees, asserting that as the time for the bituminous strike approaches evidence accumulates that the hold of the United Mine Workers upon union operators will be broken. They further point out:

"This does not mean a short strike, but rather a long strike could bring such results. Neither side, as a matter of fact, can think of a short strike. The union could not possibly expect to get any kind of terms in a few months, and union operators would not be able to supply much work even if a settlement were offered on their own terms, which of course is out of the question.



Washington (D. C.) Post

The Sixty-ninth Congress Ends With a Bang!



Cincinnati Enquirer

Doesn't Anyone Love Uncle Sam Any More?

"In this department of the American Metal Market figures were given showing that for two successive weeks, ending February 12th and 19th, respectively, there were decided declines in the total of bituminous coal production. Now the week ended February 26th is reported on, showing a greater loss still. The average in the four weeks through February 5th, 13,541,000 net tons, may be taken as basis for comparison, and the week ended February 26th shows only 12,761,000 tons. The Washington's Birthday holiday is counted as nine-tenths of a full day. Adding the tenth of a day for comparison makes a nominal rate for the week just under 13,000,000 tons, or say 550,000 tons less for the week than the average rate in the four-week period taken for comparison.

"Part of the decrease may be ascribed to the progress of the season, involving less movement of domestic coal. Part is probably due to some large consumers having their stocking well in hand, but other and smaller consumers have been coming forward with stocking programs. Altogether there is no doubt that consumers' stocks April 1st will be unprecedentedly large.

"This week the Bureau of Mines presents an interesting compilation, showing for various years 1905 to 1925 inclusive, the production by mines in different classes as to their annual production. The production of the smallest mines reached their maximum contribution to the total tonnage in the year 1922, the last strike year, so that the showing is not absolutely conclusive, but in general one can see in the annual figures since then a progressive swing of the small mines being less and less in evidence and of

the large mines increasing in importance. Thus in 1925 the mines producing more than 200,000 tons annually contributed 53.7 percent to the year's output, this comparing with 49.0 percent for 1924, 47.2 percent for 1923 and 31.5 percent for 1922. To a great extent this represents growth of nonunion mining. There is no doubt that since the 1922 strike the nonunion fields have been growing at the expense of the union fields, not merely in the amount of coal they mined, but in the productive capacity as the non-union mines have had opportunity to improve their facilities while in general the union mines have had no such opportunity, being unable to employ even the capacity they had.

"In the circumstances it is clear that it is the breadth of the coming strike that will count, i.e., the extent to which it will tie up nonunion capacity. Merely a strike at the union mines would amount to almost nothing. Even the middle of April will not show this. The strike will be full of news throughout. Some nonunion mines may close at once, but the United Mine Workers have no thought of staking the issue on the initial showing."

The Swing-Johnson bill for the development of the Colorado River and flood control was opposed by Representative Leatherwood, Utah, in a speech in the House in which he contended that the rights of the seven states in the waters of the Colorado River can only be determined by the Supreme Court of the United States. Mr. Leatherwood stated:

"You must bear in mind that there are only two sources from which allocation of the unappropriated waters



Cincinnati Enquirer

More Water for the Ducks To Swim In

of these western streams can be had; first, by the states themselves entering into a voluntary agreement or treaty by and with the consent of the Congress; and the other, through a court of competent jurisdiction. But Congress has no power to allocate the waters of one of these western streams where the doctrine of prior appropriation applies. Action by Congress at this time would only result in forcing this issue into the Supreme Court."

Continuing, he said: "The only argument for putting the Government into this particular project is that because of its international aspect, and because it is connected with the flood control and irrigation project, it should be handled by the Government. Not one of these reasons present a sufficient justification for the proposal. They are all based on the assumption that if the Government does not own or operate the power plant, these other things will be interfered with. * * * In this bill you will find a tendency on the part of the Government to invade the rights of the states and to assume control of public utilities; to take from the states their right to control and manage these industries. The provisions of this bill with reference to transmission lines are in point. * * * We are a Nation of energetic and independent workers, and we have demonstrated beyond any reasonable doubt that our best welfare is served by encouragement of individual effort and of private enterprise. When the principle of governmental operation of our industries shall become recognized and approved, we shall become the prey of the idle, the incompetent, and the demagogues."



© Punch (London)

The Perfect Pedestrian

The shaft is 13 by 13 ft. in cross section and, as the walls were not solid, the upper 350 ft. was lined with reinforced concrete. From this point to 50 ft. above the 1,000 level concrete rings were used and, as it is of the same section as No. 6 shaft, the same forms were used. However, they were not placed at any stated distance apart, this being governed by the condition of the rock walls. The distance between centers varies from 5 to 10 ft. It was necessary to make up new sets of the upper half of hangers to take care of the different lengths needed, and it was found that the method is very flexible and can be used where ground conditions are not good. Two $\frac{3}{4}$ -in. steel hangers were carried continuously through the concrete from top to bottom of rings to help support any ring where the ground might slip and weaken the ring. A cage has been installed with one shoe running on a 2% by 11-in. guide so inspection can be made at any time in the future.

The rings in the air raise undoubtedly increase the air resistance just as timbered sets would do, but the total height of the ring sections is only 600 ft. and the area 169 sq. ft., while the outlet section from the fan is only 155 sq. ft. in area.

CONCENTRATION PLANT AT UNITED VERDE

(Continued from page 304)

The concentrator building covers an area of 154 by 132 ft. including the bin and space for small tools and the flotation blowers. A separate room is also provided for an electric sample drier and for office space.

Both the grinding section and flotation aisle are large enough for additional equipment to increase the capacity of the plant practically 100 percent. The filter building is 74 by 96 ft. in plan, and sufficient space is provided for one additional filter, with storage and accessories. The grinding mills are served by a 10-ton three-motor electric crane; an electric beam crane of 1-ton capacity is provided for the flotation aisle, and a 2-ton hand operated crane serves the pump floor of the filter plant. Beam trolleys are arranged for other equipment outside of the above floors.

The conveyor galleries are 10 and 11 ft. wide, with spans up to 85 ft. Gallery floors are of precast concrete slabs, and the corrugated siding extends about 5 ft. 6 in. above the floor, with a continuous open space 2 or 3 ft. wide, for light and ventilation.

The design of the buildings is simple, symmetrical, and suited to the climatic conditions. All construction is fireproof, and safety of operation is one of the primary considerations. Good light is provided by day and by night, and the

ventilation is ample. All windows are of ribbed glass, and doors, siding, and roofing are of galvanized copper-bearing steel. Dust-tight partitions are provided between the ore bin and the rest of the concentrator, and, in addition, a dust-collecting system will be installed for the conveyor system below the bin.

Floors will have ample slope to drainage sumps for returning floor wash to the grinding circuit, or otherwise disposing of it, and all grease and oil will be trapped and retained.

The table shows the type and manufacturer of the principal equipment used in the new concentrator.

INDUSTRIAL DEVELOPMENT CONFERENCE

(Continued from page 286)

Mobile, arriving there March 23, where they were the guests that day of the Gulf, Mobile and Northern Railroad on a tour of inspection of the new state terminals and other industrial developments. On the evening of March 23 the delegates left on special cars over the Gulf, Mobile and Northern Railroad for Laurel, Miss., where on March 24 they visited the fibre board plant and other industrial developments, and made an automobile trip through the fruit, horticultural, and agricultural district in the cut-over belt of southern Mississippi, and were luncheon guests of the Chamber of Commerce and Rotary and Kiwanis Clubs. On the evening of March 24 the delegates left on special cars for Louisville, Miss., where on March 25 they were the guests of the Rotary Club. They visited the new brick and tile plants, the new coal mine, and the baukite deposit, fullers earth, bauxite, glass sand, kaolin and other mineral deposits of Winston and Noxubee Counties. After dinner that evening as guests of the Rotary Club, the delegates continued by special car to New Albany, Miss., where on March 26 they made an automobile trip to the novaculite quarries and paint pigment beds. This was followed by a train trip to Amory, Miss., where they visited the new pottery and recently opened gas well, drove through the drilling operations of this potential oil field and examined rock asphalt and ochre deposits, after which the convention and tour came to an official end and the delegates dispersed home. The special car movement and entertainment was furnished by the Gulf, Mobile and Northern Railroad and the various cities visited acted as hosts to the conference delegates.

PERMISSIBILITY TESTING

(Continued from page 269)

mining, shearing, and loading machines and movable conveyors.

As is well known, the Bureau of Mines has no mandatory powers in compelling

the use of its permissible materials, machines, devices, and apparatus, but there is constantly increasing demand by mine operators for greater protection from accidents in their mines. Although most of the needs apply to coal mining, danger from inflammable gas may arise in driving tunnels in shales and in drift and alluvial material. It may be a surprise to many that disastrous explosions have occurred in certain tunnels driven under lakes and rivers for water supply of cities in which inflammable gas has been encountered coming from embedded vegetable material or escaping from the deeper strata.

In metal mining permissible explosives are increasingly used to prevent ignition of sulphide ores, or timber in caved ground, or in poorly ventilated places, to limit the amount of toxic gases given off in blasting, because selection can be made of certain classes of permissible explosives which give off relatively little poisonous gas in blasting.

In conclusion, it may be fairly stated that the approval system of the Bureau of Mines has become a vital necessity to enable coal-mine operators to meet increasingly dangerous conditions found in deeper and intensive mining and dangers arising from increasing mechanization of mines using electric power.

The permissibility system, however, to be successful must receive the cooperation of the users of permissible materials and machines. The mining officials must require that the conditions of permissibility set forth in the schedule and at the time of issuance of approval by the Bureau of Mines be strictly observed and that the machine or apparatus be maintained in good condition and without alteration. Thus users are equally responsible in maintaining effectively the system of permissibility.

PRODUCTION OF MAGNESITE IN 1926

THE production of crude magnesite in the United States in 1926 was 133,500 short tons, valued at \$1,200,830, according to statistics compiled by J. M. Hill, of the Bureau of Mines. Four operators at five mines in four counties in California produced 53,940 tons of crude magnesite, valued at \$604,130; all of them reported only fair business, due to foreign competition and lower prices on all products. All of the output in Washington was from the mines of the Northwest Magnesite Co.

Sales of magnesite of domestic origin in 1926 were 1,540 tons crude, 18,580 tons of caustic calcined (a decrease of approximately 22 percent as compared with 1925), and 42,540 tons of dead-burned (an increase of 46 percent as compared with 1925), having a total value of \$1,703,490.



Park Utah Consolidated Increases Dividend Payments

The quarterly dividends of the Park Utah Consolidated Mines Co. have been increased from 15 to 20 cents per share, the company announces in making the first allotment for 1927, which will amount to \$418,700. This disbursement makes the grand total paid by this Utah mining company \$33,661,536. President George W. Lambourne announced that the change in the dividend rate from 15 to 20 cents a quarter was easily made possible because of the recent perfecting of pumping, hoisting and haulage facilities at the mines.

What is regarded as the stope of largest promise in the mine has been opened by the Constitution Mining and Milling Co. on Pine Creek, in the Coeur d'Alene region of Idaho, according to report from William P. White, manager. So far it has been opened for 100 feet horizontally and is of good width.

Anaconda Mines Closed

The Mountain View, Steward and Belmont mines of the Anaconda Copper Mining Co. have been closed down. In a statement, J. R. Hobbins, vice-president, gives the poor condition of the copper market as the reason for the curtailment. About 1,200 men were affected. Unofficial reports attribute the curtailment to agreements with the Copper Export Association.

Tintic Standard Increases Dividend

The Tintic Standard Mining Co. has increased its dividend rate from 20 to 40 cents a share quarterly. The current payment calls for a total of \$461,166. On this basis the Tintic Standard ranks second to Utah Copper as a dividend payer. Park Utah's recent action in increasing its rate to 20 cents makes that company a runner-up for second place.

Inspiration Curtails

Approximately 700 men were laid off early in March by the Inspiration Consolidated Copper Co. Unsatisfactory condition of copper prices make the move advisable, officials said, and future operations of the company will be gauged by the market price of copper.

Electrification of Pioneer Iron Mine

The Oliver Iron Mining Co. has authorized the electrification of the Pioneer mine at Ely, Minn., on the Vermilion iron range. The Pioneer steam hoists will be replaced by electric hoists. All equipment will be changed to drive electrically. Power will be purchased from the Minnesota Power and Light Co.

J. E. Spurr, for seven years editor-in-chief of the *Engineering and Mining Journal*, will retire from that position on April 15. Announcement of this action was made in the last issue of the JOURNAL. No intimation is given as to who will be his successor.

NEVADA BELLEVUE CO. LEACHING COPPER IN PLACE

SUCCESSFUL leaching of copper oxide ore in place is being made by the Nevada Bellevue Copper Co., at Contact, Nev. About 30 tons of the metal has been recovered and the first shipment, to the American Smelting & Refining Co., at Murray, Utah, ran better than 86 percent copper.

The company estimates 400,000 tons of ore available for this method of treatment, from which it is expected that eight or nine million pounds of copper may be recovered. The block of ground now being worked lies above the Ilo tunnel level, which cuts the ore body at 250 ft. from the surface. A solution of 3 percent sulphuric acid is injected at the top of the ore body and after percolating through the ore is caught in a dam on the adit level.

From the dam in the tunnel the solution is conveyed 2,000 ft. to the portal through a wooden pipe line to 12 vats, each 15 by 6 by 5 ft., where the copper is precipitated on scrap iron. The ore now being treated contains about 70 pounds of copper per ton and laboratory tests show that 60 percent is acid soluble.

The work is in charge of W. E. Dunkle, general manager, who formerly was field engineer for the Kennecott Copper Co.

Surveys Field for Steel Plant in Montana

Col. Chester T. Kenna, geologist and mining engineer, Helena, Mont., is reported to have made a survey of the possibilities of an iron and steel plant in Montana for a group of capitalists.

"Among a half dozen or more high grade iron ore ranges in the Northwest, Running Wolf iron range, located in central Montana, about 50 miles southeast of Great Falls and about 80 miles northeast of Helena is, perhaps, best known," he says, "and this iron range lies practically right beside the coking coals of Montana.

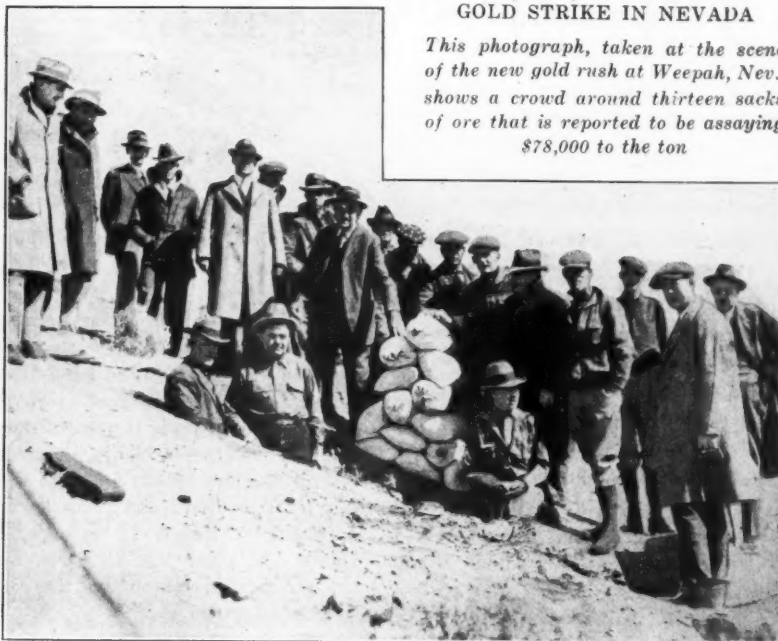
"At points where the width of the vein has been determined it ranges from 10 to 80 feet, with an average width of 30 feet. The ore is red hematite. Average analyses show 64.76 percent of iron, 0.0093 percent phosphorus and 4.83 percent silica. In quantity this range will, upon development, doubtless compare favorably with the very greatest of the Lake Superior iron ranges.

"The Cascade-Meagher coal field is about 85 miles long. The coal compares favorably with Connellsville, Pa., coal, and the greater part of it is coking coal from which an excellent coke can be made for blast furnace use. There are at least 400 square miles of coal bed ranging from 5 to 20 feet in thickness.

"The Madison limestone, of the carboniferous system, about 1,000 feet thick, usually forms the foot wall of the iron vein in Running Wolf iron district."

Silver King Coalition Annual Meeting

At the annual stockholders' meeting of the Silver King Coalition Mines Co., President David Keith's report covering 1926 operations showed that the year was a particularly good one and that dividends declared and paid had been the largest in the history of the company. The total was \$1,337,710, while the grand total of dividends paid from the mines now comprising the company's holdings amounted to \$20,184,570. The officers of the company were reelected, and John K. Hardy was selected as a director to succeed the late Moylan C. Fox. The directors reelected are: Henry Newell, W. J. Halloran, James Ivers, Thomas F. Kearns, David Keith, W. Mont Ferry, F. J. Prescott and M. J. Dailey.



GOLD STRIKE IN NEVADA

This photograph, taken at the scene of the new gold rush at Weepah, Nev., shows a crowd around thirteen sacks of ore that is reported to be assaying \$78,000 to the ton

International Newsreel Photo

Phelps Dodge Shaft Progressing

The new three-compartment shaft of the Phelps Dodge Corporation, Copper Queen Branch, Bisbee, Arizona, has progressed to more than 200 feet. The shaft is being sunk in Warren by the Longyear Development Co., which is averaging six feet daily. The contractors are using three shifts for the work.

Extensive Development at Cole Shaft by C. & A.

The Calumet & Arizona Mining Co., Harry A. Clark, general manager, Warren, Arizona, has announced the inauguration of an extensive development campaign at the old Cole shaft in South Bisbee. To enable it to carry on its proposed development program at the shaft an order has been placed for an Allis-Chalmers double drum hoist, which will be installed at the site within the next few months. The shaft will be retimbered and such other equipment as needed installed, including a new change room for employees and a heating room. Operations were suspended at the Cole shaft five years ago, this being one of the earliest producing properties in the district. The shaft is 1,500 feet deep. The new hoist will be electrically operated, the drum 60 inches in diameter with a 48-inch face. The hoist also has a weight capacity of 16,000 pounds with a hoisting speed of 1,000 feet a minute. The machine has a rope capacity of 2,800 feet. The entire equipment will weigh approximately 100,000 pounds.

Monetary Metals Co.

At the intersection of the south silver vein and the Washington gold vein, the Monetary Metals Co., Idaho City, Idaho, has an ore body seven feet in width, carrying values from \$45 to \$112 in gold and from 70 to 136 ounces silver per ton. The oreshoots have been proven to contain more than 65,000 tons of silver-gold ore averaging \$16 a ton. Shipments are not being made owing to insufficient power to operate pumps and to run a hoist and drills. Frank E. Johnesse, Boise, Idaho, manager of the company, has completed the financing of the mill, now in process of construction, and as soon as this is completed power will be turned on.

MANGANIFEROUS IRON ORE

OGLEBAY, NORTON & CO. has issued a handsome little book entitled "Why Charge Manganiferous Iron Ore in the Open Hearth." This book explains concisely why manganiferous pig and manganiferous ores improve the quality of steel. The presence of manganese eliminates sulphur in the steel, reduces oxidation and saves appreciable quantities of ferro-manganese, fluorspar and lime in the charges, beside increasing the output of steel. The book also contains information on "manganate," a manganiferous iron ore produced at the Bristol mine of the company in Crystal Falls, Mich.

International Mercury Corp. Moves to Los Angeles

Los Angeles, California, has become the world's center of quicksilver production as a result of the removal of the offices of the International Mercury Corporation from San Francisco to the Subway Terminal Building, to be nearer the base of supply and for convenience to markets.

Last year the International company produced 9,000 of the 12,000 flasks of mercury produced in the United States, and it is making preparations which it is hoped will enable the company to turn out 25,000 flasks this year. The company has eight plants operating, the most noted of which are located near Napa, San Luis Obispo and Monterey, in California.

The demand for mercury has increased greatly since the General Electric Co. developed its mercury vapor boiler for the generation of power about three years ago. This boiler uses 30,000 pounds of mercury instead of water. When heated, the mercury gives off a vapor which, acting under pressure, generates more power than can be generated by steam. After generating power the vapor returns to its first state and the mercury is again used. This repeated process uses but very little mercury and is asserted to use about half the fuel required by a steam boiler to produce the same energy.

Southern Pacific Increases Amount of Copper Consumed

The report of the Southern Pacific Co. on the amount of copper which they have used during the past year showed an increase of over 10 per cent, according to a report from C. R. Harding, engineer of standards of the Southern Pacific, and made through the Arizona Industrial Congress.

The total amount of copper and brass used as reported by Mr. Harding showed 1,871,747 pounds, and this is not inclusive of copper and brass used in the construction of equipment as the company buys such as cars, locomotives, etc.

Among the larger items was 1,451,610 pounds of ingot copper, 33,585 pounds of sheet copper, 32,918 pounds of copper tubing, 330 miles of copper wire, having 89,613 pounds of copper, 12,132 pounds of bar brass, 2,742,101 feet signal wire, containing 63,931 pounds of copper, and innumerable other items.

The amount of copper and brass used during 1925 totaled 1,612,999 pounds, or 168,748 pounds less than in 1926. The Southern Pacific Co. have assured the copper distribution committee of the Arizona Chapter of the American Mining Congress that they are very much interested in using copper and brass wherever it can be shown to be of advantage in their work.

Rico Argentine Installs New Compressors

The Rico Argentine Mining Co., at Rico, Colo., is installing new electrically driven compressors at the Blackhawk mine. Since taking over the property in 1925, the Rico Argentine has erected two aerial tramways, buildings at the tunnel level, laid new air lines, reconditioned the mine throughout, and advanced the workings by 540 feet of new raises and drifts.

Pickands, Mather Takes Group Insurance

Pickands, Mather & Co. has made arrangements for group insurance to cover all its employees in the Lake Superior region. This is a very satisfactory form of insurance which is being adopted by many of the large corporations all over the country. Other companies in this district have recently completed arrangements for taking such insurance.

Pickands, Mather Buy Croft Mine

The Croft mine on the Cuyana range has been purchased by Pickands, Mather & Co., Cleveland, from John A. Savage & Co. The mine, to be operated soon, was opened 13 years ago but has been idle for some time.

Work Under Way at Cliff

At Calumet & Hecla Consolidated's Cliff exploration in Keweenaw county, Michigan, preliminary work is well under way. No. 1 shaft has been pumped out and timbering is proceeding. The old timber sets will be replaced. The three old shafts will be used in development work, No. 1 as a supply shaft. All pumping will be done from No. 1. Installation of the surface plant is about completed. A considerable force of men is employed and some of the old houses at the location have been repaired.

Explore Tract West of Clark Mine

The Cleveland-Cliffs Iron Co. has moved a diamond drill to explore a 40-acre tract adjoining the Clark mine on the west. The Clark mine is situated north of Crosby, Minn., on the Cuyuna iron range. The Cleveland-Cliffs Co. has an option on the Clark mine and has been employing four drills on the Clark and at present has three drills there, one rig having just been moved to property on the west.

Magma to Sink New Shaft

A new shaft is to be sunk at the property of the Magma Copper Co. at Superior. It is planned to sink this shaft to a depth of 2,500 feet and to connect the same by cross-cuts to the present working shaft.

NEW MOTION-PICTURE FILM TELLS STORY OF COPPER

THE mining and treatment of one of the world's most universal and essential metals is picturized in an eight-reel educational motion-picture film "The Story of Copper," just completed by the Bureau of Mines, in cooperation with one of the large copper-producing companies. The film is in five parts, depicting graphically copper prospecting, mining, milling, smelting and refining methods. Mines and mills in Alaska, Montana, Michigan, Utah, Nevada and Arizona, as well as smelters and refineries in different localities, were visited in the preparation of the film.

The methods by which copper ores are mined from vast open pits, hundreds of feet deep, are depicted. The blasting methods employed in breaking up the ore, and its excavation by means of monster power shovels are shown.

Drilling and blasting processes, the hauling of the ore on underground motor trains, the transportation of ore over aerial tramways, the various methods of mining, such as shrinkage stoping, caving, rill stoping, and the cut-and-fill and room-and-pillar methods are all depicted.

In the Butte district the elaborate methods used for ventilating the deep, hot mine workings are picturized, as well as the wet drilling methods employed for the purpose of keeping down rock dusts. The audience is also made to see the operation of gigantic pumping systems.

The various processes employed in the treatment, the crushing of the ores, their concentration on jigs and

tables and leaching by the use of sulphuric acid solutions are depicted.

The smelting of the richer ores and concentrates in blast furnaces and reverberatory furnaces is shown. A series of scenes depicts graphically the processes by which the copper is eventually refined.

Much of the photographic work necessary in making this film had to be done under unusual conditions. A special type of powerful electric lighting equipment, of 12,000,000 candle-power, was used in photographing the underground scenes. At one mine the photographer with his camera and lighting equipment worked at a depth of more than a mile below the surface. At the smelters the camera was so close to the great converters and furnaces that special equipment was required to withstand the intense heat.

"The Story of Copper" is one of 46 subjects, comprising some 1,700 reels, in the motion picture library of the United States Bureau of Mines. These films have been produced under the supervision of the Bureau of Mines, in cooperation with various American industries. The entire cost of producing each picture and of providing copies for circulation is borne by the cooperating agency.

The films are loaned free of charge to those who wish to borrow them. Application may be made to either the United States Bureau of Mines, at Washington, D. C., or the United States Bureau of Mines Experiment Station, Pittsburgh, Pa. A complete descriptive list of the films will be sent upon request.

White Hills Silver Mines Arrange Financing for Shaft

The White Hills Silver Mines, Inc., Chloride, Arizona, has arranged with outside capital for the financing of half the cost of sinking its three-compartment shaft, the company taking care of the balance. All machinery and equipment for the hoisting plant has been installed and is in commission, according to J. K. Turner, consulting engineer. The shaft has attained a depth of 125 feet and progress is being made at the rate of two feet daily, with two shifts at work. At 100 feet the shaft passed through an old stope in the middle vein of the Grand Army vein system, and ore left on the walls by former operators returned good values in silver and gold.

North Star to Erect Larger Mill

The North Star Mining Co., operating the Idaho mine, Amado, Arizona, George McDeavitt, superintendent, is to erect a new and larger mill at its property in the western part of Santa Cruz county. The mine has suspended operations until the new mill is completed, the present mill having been declared too small to handle the output of ore.

Shattuck-Denn and C. & A. to Explore John Daisy Claims

Diamond drilling operations will be started shortly at the John Daisy claims, owned jointly by the Calumet & Arizona Mining Co. and the Shattuck-Denn Mining Corporation, Bisbee, Arizona. It is proposed in exploring this property to go to a depth of 1,000 feet.

Great Bend to Operate Goldroads Mine

The Great Bend Mines Co., Goldfield, Nevada, has taken a three-year purchase contract on the Goldroads mine at Oatman, Arizona. This mine, now owned by the U. S. Smelting, Refining and Mining Co., was worked for many years and has a production record of more than \$11,000,000. Under the purchase contract, the royalties will apply on the purchase price. The mine is equipped with a 40-stamp mill, which has been recently overhauled. However, a test run made the first week of February on 200 tons of ore disclosed that certain changes were necessary. This work will be completed this month and the mill put in operation.

The Great Bend has also entered into an agreement with the White Hills Silver Mines, Inc., whereby it is to pay one-half the cost of shaft construction at the latter's property for the privilege of entering its own ground through this shaft.

New Dredge in Operation

Ogden and Wilson's new gold dredge on Roaring River, a tributary of Cottonwood Creek in Shasta County, Calif., was started up early in March. The dredging field is near Gas Point. The new dredge is a small one, as a larger dredge could not work on Roaring River. This makes the third dredge in operation in Shasta County, two large dredges working on Clear Creek.

Important Discoveries in Tintic District

One of the most important ore discoveries in Utah in recent years has been made at the North Lily Mine in the Tintic District, near Eureka, Utah. The North Lily Mine is controlled by the International Smelting Co. Exploration of the North Lily ground was begun by drifting from the Tintic Standard Mine through an arrangement with the Tintic Standard Co.

The ore is a lead-silver-gold ore of high grade. The ore body has been pierced for a distance of 113 feet, but it is not yet certain whether it has been crosscut or traversed along the strike. Fifty tons of ore per day is now being shipped from the North Lily.

The drift to the North Lily ground passed through Eureka Lily ground owned by the Chief Consolidated Mining Co. and 40 feet of low-grade ore was cut in the Eureka Lily. The Chief Consolidated has effected a working agreement with the Tintic Standard Mining Co. to further explore this ore.

The Tintic District has large areas of unexplored ground, and it is probable that the productive area will be further increased.

IRON ORE SHIPMENTS FROM LAKE SUPERIOR

IN 1926 the six big ranges of the Lake Superior district forwarded 59,838,059 tons of iron ore, including rail and lake shipments, representing the output from 176 mines. This compares with 55,377,925 tons in 1925 shipped from 185 mines. The average shipment per mine last year was 339,988 tons as compared with an average per mine in 1925 of 299,357 tons, and 240,445 tons in 1924. The tendency in recent years has been to work the large properties and close down the small ones of the district, and the average tonnage per mine appears to show an increase each year.

In 1926 there were 27 operating companies, besides 6 others of minor importance contributing small tonnages, as compared with 30 important companies and 13 lesser ones in 1925.

Tunnel Progressing

The long working tunnel of the Seven Troughs Reorganized Co., near Lovelock, Nev., is being advanced at the rate of 17 feet daily with three shifts working. The tunnel will be about a mile long and is intended to drain the old coalition workings and to develop the property at an approximate vertical depth of 2,000 feet. Several leases are active on the Coalition, Dixie Queen and Signal properties.

New Smelting Co. Organized

The National Smelter Corporation has recently been incorporated under the laws of Nevada with a capitalization of \$600,000. The incorporators state plans are proceeding for early erection of a lead-silver smelter between Battle Mountain and Elko, Nev., to furnish an outlet for the increasing lead production from Nevada and California, which now must be shipped to Utah. It is expected that ores will come from Quartz Mountain and Eureka, Nev., and Inyo County, Calif.

Goldfield Tailings Dumps to be Retreated

A plant to treat the old tailings of the Goldfield Consolidated Mines, Goldfield, Nev., is nearing completion. Production is scheduled to begin about March 10 at the rate of 1,000 tons daily. The management estimates that 3,000,000 tons of tailings sampling \$1.67 per ton are available.

Tom Reed Co. Building New Mill

The Tom Reed Co. is building a new mill at its Allison Mine near Tucson, Ariz. The mill will have a capacity of about 40 tons per day. It is primarily a testing unit, as the ore has proved difficult to treat. The mill is expected to be in operation by April 1, 1927.

The Allison property was taken over under lease by the Tom Reed Co. in March, 1926. The shaft has been sunk to a depth of 525 feet and levels opened at 125-foot intervals.

Jack Zwinge, of Oatman, Ariz., is in charge of the Allison Mine. The mill is being designed by Paris V. Bough, formerly superintendent of the Tom Reed Mill at Oatman.

Shipments of Ferro-Manganese From Boston Hill Increase

Shipments of ferro-manganese ores from Boston Hill at Silver City, New Mexico, have been increasing since the first of the year and are to be further increased as facilities permit. During the last few weeks 12 to 13 carloads of ore have been shipped daily from the two mines. Every kind of vehicle capable of hauling ore has been employed. The ore is shipped to the steel works of the Colorado Fuel and Iron Co., Pueblo, Colorado. Robert I. Kirchman and Ben D. Goodier are in charge of mining operations for their respective companies.

New Smelter at Pitiquito, Mex.

A 35-ton lead stack, operated by steam engines and boilers, is to be erected at Pitiquito, Sonora, Mexico, by J. N. Acosta, formerly city engineer of Mexicali and at one time head chemist for the Shannon Copper Co. Affiliated with Mr. Acosta is Roland Reed, El Centro capitalist. The smelter is to be operated as a custom smelter, supplying a market for the ore of the district. These properties have been lying idle for the last 20 years as the nearest shipping point is 70 miles distant. It is expected to have the smelter blown in within two months.

A. S. & R. Reconditioning Mexico Mine

The American Smelting and Refining Co., Taviache Unit, Taviache, Oaxaca, Mexico, continues work of unwatering the old San Juan shaft and is also doing considerable sampling of other adjacent properties with the view of finding sufficient milling ore to warrant the erection of a mill. It is claimed that there is now sufficient ore on the San Juan dump to cover the original cost of the mine, purchased about a year ago. The work is directed by P. F. Quinn, superintendent.

Combined Metals Co. Installs New Equipment

Installation of a steam hoist, two compressors, an electric lighting plant and other equipment has been completed by the Combined Metals Co., Pioche, Nev. This new plant replaces the one destroyed by fire last September.

The management reports that a large tonnage of silver-lead-zinc ore has been blocked out and that production will soon be increased to 100 tons daily.

Clipper-Tungsten Co. to Operate Good Friday Mine

The Clipper Tungsten Co. has been incorporated by H. F. Giller, E. E. Wiley and Sam Craig, with a capital stock of \$50,000, held mostly by the three above named. The company proposes to develop the Good Friday mine at Sugar Loaf, Colorado, under the management of H. F. Giller. Miners are repairing the timbering in the 300-foot shaft, and in the tunnel, which is 1,000 feet in length. The vein in the tunnel is 20 inches thick and it is estimated that there is \$10,000 worth of ore exposed and ready to be taken from the workings. Plans have been made for the erection of a mill to refine the product into a 40 percent concentrate.

The Nugget and Lead Gold Mines, Inc., 1750 Champa Street, Denver, is making preparations for the reopening of its properties in Russel Gulch district, near Idaho Springs, Colorado. During the past month, officials state that they have shipped ore from the War Dance mine which assayed \$5,000 per carload.

Prepare to Ship From Union Iron Mine

The Union mine of the Republic Iron & Steel Co., on the Mesabi iron range and situated just east of Virginia, Minn., is making repairs preparatory to resuming of mining after a number of years of idleness. The Union mine is worked by milling system in connection with underground mining. The mine will employ a steady force of men and will be important to the welfare of Virginia.

New Hanna Explorations

The M. A. Hanna Co. is drilling on two new explorations. The company has one drill operating in the Iron River district on the Menominee iron range of Michigan on the West Anna property. This lies west of the Anna (old Wickwire) property in the city of Iron River. The company drilled last year on the Anna property.

The Hanna company is also exploring with diamond drill an area on the Cuyuna iron range of Minnesota, north and east of the Preston reserve, about three and one-half miles northwest of Crosby.

MICHIGAN COLLEGE OF MINING AND TECHNOLOGY

THE Michigan Legislature has passed a bill changing the name of the Michigan College of Mines at Houghton to the Michigan College of Mining and Technology. One of the first steps under this bill will be to act on the authority given to enlarge the curriculum to include engineering subjects other than those restricted to mining engineering. Thus the college will become in fact as well as in name a technical school. Degrees now are given in mining engineering, metallurgy, chemistry and general engineering. In civil, mechanical and electrical engineering, work equivalent to the first two years has been given and now it is planned to make these full courses.

The bill passed by the legislature provides for the granting of a scholarship to each state in the Union, each province of Canada, each possession of the United States and each of the Latin-American countries. This, it is expected will result in the accession of a considerable number of high grade students who will help to maintain the high standards of the college and prove of distinct value as a broadening influence. In addition to these scholarships, one scholarship is offered each year to each of the high schools of Michigan.

Buckeye Copper Co. Installs New Machinery

The Buckeye Copper Co., Arlington, Arizona, is installing heavy sinking machinery, including a 160-horsepower Chicago Pneumatic Benz Diesel engine for belted service, and a large two-stage, belt-driven air compressor. Other equipment includes machine drills, drill sharpener and hoisting plant. This follows the preliminary work performed during 1926. The company's holdings comprise 1,360 acres of richly mineralized ground, 62 miles southwest of Phoenix.

The Hays-Nevada Mining Co. has opened a four-foot ore body on the 200-foot level of its New London mine, Kingman, Arizona. The company is operating two shafts on the mines and is shipping ore to the smelters. Lessees are also shipping ore from the property.

Grant Mine Leased

The Grant mine, Mina, Nevada, has been leased to Los Angeles capitalists, headed by William A. Hooten. With 10 and 20 stamps in commission, the mine is producing steadily and a compressor, power drills and other equipment are being installed. The property is owned by the Webster Mines Corporation, controlled by W. J. Webster, Philip Wiseman and other Los Angeles men.

Zenda Gold Increases Production

The Zenda Gold Mining Co., Caliente, California, G. C. Taylor, manager, has made arrangements for a further increase in production to about 175 tons daily. The reduction plant is a modern electrically operated cyanide mill, where grinding is done by an eight-inch Hardinge ball mill, followed by Parral agitators and counter-current decantation in Dorr thickeners. The company is developing to explore the downward extension of the ore bodies. A sample taken across 300 feet of the Silver Monument vein gave returns of 4 ounces in silver. A compressor plant is being installed and machine drills will soon be placed in operation. It is believed that sufficient ore will soon be blocked out to justify the construction of a large milling plant.

As soon as the weather permits, a 25-ton mill is to be installed by the Triumph Lead-Silver Mining Co., Carson City, Nevada, George S. Clack, manager. Orders have been placed for an ore crusher, ball-mill concentrators and flotation units. A large tonnage of silver-lead ore has been opened on the 250-foot level, with the veins showing promise of persisting to depth.

The Humboldt Sulphur Co., Sulphur, Nevada, is making preparations to install a larger plant and is said to have been financed to the extent of \$2,000,000 by New York and California capitalists.

The Mazapil Copper Co., Saltillo, Coahuila, Mexico, R. H. Jeffrey, general manager, has ceased all operations at Acacio where it was working the Norias silver-lead mines. All excess material and machinery which had been placed on the ground is being shipped to Saltillo. The merchandise store at Acacio station has also been closed.

The shaft of the Katherine East End Mining Co., Kingman, Arizona, is down 200 feet and a station is being cut. W. A. Smith is superintending operations on the mine and has done a large amount of work since operations were started a few months ago. New and heavier machinery has been installed and is now functioning.

Drilling Difficulties Caused by Bentonite

For the prevention of difficulties caused by bentonite formations likely to be encountered in drilling for potash and petroleum, the effect of temperature, hydrogen ion concentration, and of equivalent quantities of different salts on a typical Wyoming bentonite have been determined and interpreted by the Rare and Precious Metals Station of the Bureau of Mines, Reno, Nev. A paper on the swelling of bentonite and its control has been prepared for early publication.

Metallurgy of Tin

Most of the supply of metallic tin is recovered from cassiterite by pyrometallurgy (smelting), state the Bureau of Mines in Information Circular 6018, recently issued. This method of obtaining tin was evolved in prehistoric times when primitive man heated a mixture of the ore and a reducing agent, such as charcoal (carbon) to a high temperature. In modern practice, ore or concentrates containing one or more percent of sulphur are roasted before they are smelted. This roasting is necessary because the tin sulphide, or matte, formed in the smelting of a tin ore containing noteworthy amounts of sulphur is readily volatilized. The volatilization not only causes much loss of tin but gives by-products that are difficult to reduce. In the roasting process the temperature maintained is sufficient to drive off the sulphur and to leave less than 0.005 percent in the ore.

In smelting the roasted ore or concentrate, which contains upwards of 60 percent tin, it is, as a rule, thoroughly mixed with 20 to 30 percent of pulverized anthracite coal. The balance of the furnace charge consists of silica, iron and lime in sufficient quantities and proportion to give a slag containing approximately 35 percent silica, 12 percent iron, and 25 percent calcium oxide. Ores low in iron can be smelted in one operation, but those containing more than 3 percent of iron require two-stage smelting, in which 85 to 90 percent of the tin is reduced during the first stage. The slag, which is resmelted, contains the rest of the tin, and yields an alloy of tin and iron. The separation of the tin in this alloy accounts for the major part of the cost of getting the metal from the ore. To separate the tin small amounts of the alloy are mixed with crude ores relatively free from iron and are smelted.

Secretary Hoover Appoints New Members to Wood Utilization Committee

Four new members, all prominent in the American lumber industry, have been appointed by Secretary Hoover to serve on the National Committee on Wood Utilization, of which he is chairman.

The new appointees are: Harry B. Krausz, manager of the Dimension De-

partment, Pearl River Valley Lumber Co., Canton, Miss.; E. F. Lindewirth, manager, Dimension Sales Department, Chicago Mill and Lumber Co., Chicago, Ill.; Charles Dregge, president, Nichols and Cox Lumber Co., Grand Rapids, Mich.; and A. L. McBean, general manager, Edward Hines Hardwood and Hemlock Co., Park Falls, Wis.

ROCKY MOUNTAIN COAL CONVENTION

THE annual winter convention of the Rocky Mountain Coal Mining Institute was held in Denver at the Cosmopolitan Hotel the first week of March. More than 100 operators and officials in the coal mining industry of Utah, Colorado and Wyoming attended.

Danger from deadly methane gas, commonly known as fire damp and feared by coal miners everywhere, will be reduced to a minimum, it is claimed, by an apparatus demonstrated at the convention by Prof. Edward K. Judd, of New York. The apparatus detects the presence of fire damp in high seams in the mine and eliminates the danger of the misuse of the flame safety lamp.

Vocational training was discussed during the convention by D. W. Rockey, H. A. Tiemann and W. C. Holman. Other speakers were F. B. Thomas, who read a paper on the work of the mine electrician; P. H. Burnell, who talked on "Progress in Rock Dusting"; L. C. Isley, electrical engineer from the United States Bureau of mines, who addressed the convention on "Permissible Electrical Equipment."

Officers elected for the ensuing year at the final session were: Edward Bottomley, of Sheridan, Wyo., president; F. L. Peart, vice-president for Colorado; R. R. Kirkpatrick, for Utah; A. W. Dickinson, for Wyoming, and Allan French, for New Mexico. The new executive committee includes S. M. Thompson and James Struthers for Colorado; P. H. Burnell and A. L. Gillin for Wyoming; L. M. Kuhns and B. B. Hanger for New Mexico; L. R. Weber and Charles Leger for Utah. Benedict Shubert, of Denver, was re-elected secretary and treasurer. Frank Sandstrom, also of Denver, was elected corresponding secretary.

Esthonian Shale to be Exploited by Swedish Interests

A concession has been granted by the Esthonian Government to Swedish interests for the breaking of a billion tons of oil shale, according to advices to the Department of Commerce.

A trial plant is already being built

where distillation of shale on a manufacturing basis will be undertaken, the report states, and the intention is to build several new factories if the trial manufacture during the first year proves to be as favorable as previous experiments. To begin with 50,000 tons of shale will be treated annually.

Swedish experts are to be in charge of the distillation and attempts will be made to extract benzene, lubricating oils and fuel oil. The capital is both Swedish and foreign, and when the enterprise is ready it is estimated that it will involve from 20,000,000 to 30,000,000 Swedish crowns.

Favorable Report on Oil Shale Test

The Navy Department has received from one of its inspectors favorable reports concerning the possibility of securing satisfactory oil products from the naval oil shale reserve in Colorado and Utah. They indicate the recovery of satisfactory fuel oil, motor and diesel engine oil. The reports are based on experiments conducted at plants at Rulison and Boulder, Colo. It is said that tests of some shale indicate recovery of 27½ gallons to 1 bbl. of oil per ton of shale.

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Members and visitors of the Arizona Chapter, The American Mining Congress, inspecting shovel operations of the United Verde Copper Co., Jerome, Ariz.

ARIZONA CHAPTER MEETS AT JEROME

THE quarterly meeting of the American Mining Congress, held at Jerome, Ariz., on March 14 and 15, was an unqualified success. Visitors were the guests of the United Verde Copper Co. and the United Verde Extension Mining Co. Including the staffs of these companies, more than 150 were in attendance, including representatives from every important district in the Southwest.

The opening session was devoted to a discussion of operating problems. The following papers were presented and enthusiastically received:

- Problems Encountered in Steam Shovel Program—By J. C. Perkins, Steam Shovel Supt., United Verde Copper Co.
- Heat Treating Rock Drill Steel—By W. P. Goss, Chief Efficiency Engineer, United Verde Copper Co.
- Ventilation Problems at United Verde Mines—By C. E. Mills, Chief Engineer, United Verde Copper Co.
- Shaft Construction Methods at United Verde—By W. J. Flood, Mine Foreman, United Verde Copper Co.
- Group Bonus System for Smelter Department—By C. R. Kuzell and J. R. Marston, Smelter Department, United Verde Copper Co.
- Supply Department Procedure at United Verde—By D. L. Bouse, Genl. Storekeeper, United Verde Copper Co.
- Purchasing Methods at the United Verde—By Dave Hopkins, Purchasing Agent, United Verde Copper Co.
- The New United Verde Concentrator—By J. E. Lanning, Chief Mech. Engr., United Verde Copper Co.

These papers will be found in the March and April issues of "The Mining Congress Journal."

Following this session luncheon was served at the United Verde steam shovel boarding house, after which there was an inspection trip through the open pit.

In the evening all guests were entertained at a banquet at the new Clark Memorial Club House, at Clarkdale. This new club has not been formally dedicated but was temporarily opened for the occasion. This splendidly appointed community club will be a lasting memorial to the spirit and enterprise of Senator Clark. Two hundred were present at the banquet.

The following day was spent in inspection trips through the mines, shops and smelters of the United Verde Copper Co. and the United Verde Extension Mining Co.'s and a golf tournament at the Verde Valley Country Club.

A high mark was set in the entertainment of the visitors. The executive officials of the United Verde Copper Co. are to be especially commended for their generosity in supplying the visitors with detailed data regarding their operating problems.

The invitation of F. W. MacLennan, general manager of the Miami Copper Co.; T. H. O'Brien, general manager of the Inspiration Consolidated Copper Co., and W. G. McBride, general manager of the Old Dominion Co., to hold the September meeting of the Arizona Chapter in the Globe-Miami District, was accepted.

A. R. Wilfley Dies

A. R. Wilfley, mining engineer and mechanical genius, internationally known for his inventions and recognized as an authority on ore treatment, died February 20, at his California home in Whittier. The mining industry is indebted to Mr. Wilfley for the invention of the Wilfley concentrating table, which made possible the treatment of ores which theretofore could not be satisfactorily handled. He constructed the first table at a plant in Kokomo, Colorado, in 1896. Up to the present time over 23,000 tables have been built and shipped to all parts of the world. He has been associated with the Mine and Smelter Supply Co., which acted as his selling agent, and who later took over the manufacture of the Wilfley concentrating table. At the time of his death he was a stockholder and consulting engineer of this company.

Tests Extend Range of Oils for Producing Lubricants

The possibilities of producing good lubricants from crude oils that today are not being refined for this purpose are promised by a series of tests conducted by the Bureau of Mines, Department of Commerce, at its San Francisco field office. The results of the experimental work indicated that, for use in automotive equipment, lubricating oils need not be refined to as high degree as for use in turbines and similar machinery, and that considerable savings may therefore be made in present oil-refining processes.

This series of engine service tests of internal-combustion engine lubricating oils made from California crude petroleum was undertaken cooperatively by the Bureau of Mines and the American Petroleum Institute. The purpose of the work was to conduct engine tests to determine the relative merits of western oils that do and do not pass the acidity and emulsion tests as set forth in the Federal specifications for class C oils.

Heavy Liquids for Mineralogical Analyses

In the course of its work for the advancement of efficiency in the mineral industries, the Bureau of Mines has studied gravity methods of concentrating ores and of separating the valuable minerals from the worthless gangue by the use of jigs, tables, or classifiers. These studies have involved the microscopic examination of ores and the making of mineralogical analyses in order to determine the different minerals present, the fineness of the mineral grains, and the distribution of these grains through the mass of an ore.

The purpose of an investigation described in Technical Paper 381, just issued, was to develop a series of heavy liquids for use in mineralogical analyses—to get a series of cheap liquids that would enable one to separate by means of the sink-and-float method the heavier mineral particles from the gangue and, if possible, to separate the various minerals from one another. The investigation has consisted largely in a study of the liquids already in use and the development of suitable liquids other than those.

The heavy liquids tested in the course of this investigation included bromoform-carbon tetrachloride, acetylene tetrabromide-carbon tetrachloride, carbon tetrabromide-carbon tetrachloride, stannic bromide-carbon tetrachloride, stannic iodide, antimony tribromide, antimony tribromide-bromoform, antimony trichloride, thallous silver nitrate, mercurous nitrate, thallous mercurous nitrate, thallium formate, mercuric chloride-mercuric iodide-antimony trichloride, sodium amalgams, and heavy colloidal solutions.

Copies of Bureau of Mines Technical Paper 381, "Heavy Liquids for Mineralogical Analyses," by John D. Sullivan, may be obtained from the Superintendent of Documents, Washington, D. C., at a price of 10 cents.

United States Consumes Much Tin, but Produces Little

The United States, the largest consumer of tin among the nations of the world, produces from its own mines practically none of this essential metal, according to the Bureau of Mines. In 1925, 76,646 tons of metallic tin were imported, while 27,633 tons of secondary tin were recovered, making a total of 104,279 tons available for domestic consumption. In the same year the mines of the United States produced but 12.3 tons of tin.

The United States is not only the greatest consumer of metallic tin, taking upward of 52 percent of the world's production, but it is also the greatest manufacturer of tin products. The most important use of tin is in the manufacture of tin plate, the chief centers of which

are in the United States and in southern Wales. Tin plate is made by covering thin rolled sheets of mild steel with a thin film of tin, which is alloyed with the iron. The sheets thus protected are used for roofing and to make tin cans or containers, cooking utensils, or other ware.

In spite of the fact that the United States produces virtually no tin, the American tin-plate industry has prospered, and today it leads the world. The present output is slightly more than 40,000,000 boxes a year, while the Welsh production is approximately half as much. Prior to the World War, Germany's capacity about equaled her needs. In India, Spain, Italy, and Japan large works have been put in operation.

The New Mexico State Legislature has appropriated the sum of \$75,000 for permanent improvements at the New Mexico School of Mines, and authorized a goodly increase in its regular maintenance appropriation. It also passed a bill which creates a New Mexico Bureau of Mines and Mineral Resources, to be located at the School of Mines as a department of that institution.

At a meeting of the Board of Regents of the School, Dr. E. H. Wells, president, was made director of the bureau, and will divide his time equally between the bureau and the administrative duties of the school.

An intensive program of construction and improvement will be begun at once by the School of Mines.

Petroleum Refining Capacity of Nation Continues to Increase

The aggregate refining capacity of the petroleum refineries of the United States continues to increase, although the number of refineries has decreased, the Bureau of Mines finds as the result of a statistical survey conducted by G. R. Hopkins, associate petroleum economist, as of January 1, 1927. On that date, there were 465 completed petroleum refineries in the United States, with a total daily crude oil capacity of 3,061,007 barrels. In addition, 7 refineries, with a potential capacity of 61,000 barrels, were in process of construction. Of the completed refineries, 327, with a capacity of 2,834,282 barrels, or 93 percent of the total capacity, were in operation, and 138, with a capacity of 226,725 barrels, or 7 percent of the total, were shut down.

Comparison with the figures of a year ago reveals that during the year 1926 there was a net decrease of 45 in the

total number of completed refineries, but an increase in total capacity of 208,040 barrels. This resulted from a steady growth on the part of many of the larger refineries, particularly those on tide water, which overbalanced the decrease in capacity due to the abandonment of a number of relatively small skimming plants.

The building program as of January 1, 1927, was somewhat larger than that of January 1, 1926. California maintained her rank as a leading state from the standpoint of refinery throughput, though Texas still leads in number of refineries. Practically all of the decrease in total number of completed refineries occurred in the Mid-Continent field; that is, the states of Kansas, Oklahoma, and Arkansas, and including the northern parts of Louisiana and Texas. In Oklahoma, approximately 15 refineries were dismantled in 1926. The only section of the Mid-Continent field where construction activity was in evidence was the Panhandle district, where the absence of trunk pipelines served as the inducement for the building of several skimming plants. Of more than passing importance was the completion during the year, by the Gulf Refining Company and the Mexican Petroleum Company, of refineries at Bayonne, N. J., and Baltimore, Md., respectively, and the building of refineries by the former company and the Roxana Petroleum Corporation at Philadelphia and East Chicago, respectively, both of which are nearing completion. Washington entered the list of states with refineries, having on January 1 two operating refineries with a total daily capacity of 5,000 barrels.

Copies of the 1927 directory of petroleum refineries of the United States, containing data regarding location, type, and refining capacity of all refineries, may be obtained from the Bureau of Mines, Department of Commerce, Washington, D. C.

Canadian Mining Congress

Arrangements are being made for a large representation of the British mining industry to be present at the Empire Mining and Metallurgical Congress to be held in Canada next August and September, according to advices to the Department of Commerce.

The "official" ship which is to carry the British delegation, the S. S. "Alaunia," will sail from Southampton to Montreal on August 13. In addition to visiting the Congress, the British delegation will make a tour of Canada, including the principal mining districts in Toronto and Quebec, and also will visit mining developments in other parts of the country, as well as various other centers of interest.

Beaver Crown Purchases Lynn Mine

The Lynn Big Six mine, at Lynn, Nevada, has been purchased by the Beaver Crown Consolidated Mining Co., Milford, Utah, for \$150,000 on a bond and lease agreement. The Beaver Crown company has agreed to construct the first unit of a mill, which is to be ready for operation by June 1. Additional units will be constructed as conditions warrant.

After 20 years of idleness, the Many Sisters mine, in the Mt. Baker district of Whatcom county, Washington, is to be prospected by Angelo Visintainer and associates of Bellingham, Washington. This group showed good possibilities for development in the early years of 1900.

Methow Mining and Milling Co.

The Methow Mining and Milling Co., Methow, Washington, Thomas Magrath, president, has installed a 30-horsepower gas engine and compressor to furnish power for the operation of the new Waugh hammer air drill. The company started operation about a year ago and the tunnels have reached a total of 600 feet, as compared with 188 feet when the company took hold of the property. Ore values are \$11 per ton in gold, silver and copper, with a sulphur content that may be used industrially. The Washington Water Power Co. will construct a line up Methow River past the mine.

Mary Murphy Mine to Reopen

The Mary Murphy Gold Mining Co., Romley, Colorado, has paid back taxes amounting to \$3,906.55 and is making arrangements to reopen the mine, which, it is said, has a record production of \$25,000,000. The mine ceased operation about four years ago and it is believed that by the new processes of treatment 150,000 tons of low-grade complex ore is commercially available. The old branch line of the Colorado and Southern railroad, abandoned several years ago, furnished an excellent roadbed not exceeding 4 percent grade. It is being considered to locate a reduction plant in the Arkansas valley, near Buena Vista, as the mine is in a narrow gulch, where milling is almost impossible without polluting the stream with sediment. This is opposed by the farmers and the towns along the Arkansas River. George E. Collins, 307 Boston Building, Denver, mining engineer and former general manager for the company, has been appointed receiver.

It is reported that the Atlas Mining Co., Pateros, Washington, intends to install a flotation mill. The tonnage opened up by development is believed to be sufficient to keep a mill in operation for a long time.

FELLOWSHIPS AT CARNEGIE

IN cooperation with the Pittsburgh Experiment Station of the United States Bureau of Mines, eight research fellowships in mining and metallurgy are offered by the Carnegie Institute of Technology during the coming year. According to the announcement, the fellowships are open to the graduates of colleges, universities and technical schools who are properly qualified to undertake research investigations.

Each fellowship carries a stipend of \$750 paid in ten monthly installments. The period of each fellowship will be from August 15, 1927, to June 15, 1928. The purpose of these fellowships, it is announced, is the solution of problems which are of special importance to the mining, metallurgical and allied industries.

Among the subjects already suggested for investigation during the coming program are the following:

MINING AND UTILIZATION OF FUELS**Origin and Constitution of Coal—**

The determination and separation of coking constituents of coal; Comparison of methods of determining the oil and tar yields of coal; The composition of low temperature tar.

Coal Mining—Determination of cost and efficiency of storage battery locomotive haulage in comparison with trolley locomotive haulage; Study of methods in blasting coal.

Utilization of Coal—Correlation of fusing temperature of coal ash with clinker formation in furnaces; Study of physical properties of coke in relation to domestic heating.

Mine Safety—Study of relation of fineness of particles to inflammability of coal dust; A study of the mechanism of spontaneous combustion and prevention of gob fires; Survey of relative tendency of various coals to fire spontaneously.

FERROUS METALLURGY

Physical Chemistry of Steel Making—Distribution of iron oxide between slag and metal; Formation and identification of inclusions; Rate of elimination of inclusions; Viscosity of open hearth slag; Equilibrium between manganese, iron and sulphur; Study of abnormality of case carburized steels.

Final selection of the problems for investigation will be made later by two advisory boards of engineers, metallurgists, mine operators, and business men who are assisting in the development of the departments of mining and metallurgy at Carnegie Tech. At the conclusion of the studies it is announced, reports will be published jointly by the Carnegie Institute of Technology, the Bureau of Mines, and the Advisory Boards. Twenty-nine of such reports have already been published since the inauguration of the present cooperative research plan in Pittsburgh.

Application blanks for fellowship appointments can be secured by writing the Secretary, Mining and Metallurgical Advisory Boards, Carnegie Institute of Technology, Pittsburgh, Pa.

Extend Butte and Superior No. 3 Shaft

The Butte and Superior Mining Co., Butte, Montana, Charles Bocking, general manager, is sinking its main or No. 3 shaft from the 3,400 level to the 3,625 point. About 200 feet south of the shaft, a winze is being sunk from the 3,400 level to provide ventilation for the development of the new level.

The Trout Mining Co., Philipsburg, Montana, Lester D. Frink, manager, has completed another 100 feet of shaft in its manganese deposit. The company was formerly a subsidiary of the Manhattan Electrical Supply Company and is one of the largest producers of battery manganese in the country. More than 50 men are employed and the ore is treated in the company's 200-ton magnetic concentrator at Philipsburg. Operations are conducted by electricity.

The Pittsburgh Bote Mining Co., Zacatecas, Mexico, J. C. Archibald, general manager, is installing another Diesel unit at the mine. The Nordberg Manufacturing Co. is doing the work. The old mill has been remodeled and is treating large quantities of ore daily. The new unit, which is nearing completion, will enable them to greatly increase the present output. The company is also operating the Veta Grande mines where a large tonnage is extracted and treated.

The Death Valley Gold Mining Co., Inc., Leadfield, California, Sol. Camp, manager, is installing an air compressor and machine drills and tunnel driving will soon be making progress at the rate of five feet daily.

Commission Recommends Resumption of Hydraulic Mining in California

The Hydraulic Mining Commission has reported to the California Legislature on the feasibility of resuming hydraulic mining in that state. The commission consisted of State Mineralogist L. L. Root and Surveyor General W. S. Kingsbury, with Arthur Jarman as secretary and engineer. The report shows that hydraulic mining may be resumed without damage to farming and other interests, but with benefit to them, and that the cost of three dams would be \$2,405,000, which would enable the mining industry to be resumed on the Bear, American, and Yuba Rivers. It is estimated that \$1,156,000 worth of gold would be mined annually under the proposed plan. It is recommended that the cost of the dams be equally borne by the Federal Government and the state of California. It is recommended that Congress authorize the California Debris Commission to purchase debris storage in a dam instead of actually building a dam; amend the manner of charging a mine for restraining its debris in a dam by making a charge per cubic yard of debris discharged from the mine so that it will be restrained by the dam, credit being given boulders and material permanently stacked at the mine; that the charge per cubic yard be determined so that the cost of dam shall be repaid by the mining of the yardage of debris restrainable by the dam.

The commission states that the plans will permit revival of mining in Nevada and Placer Counties; benefit Marysville, Sacramento, and San Francisco because of purchase of piping, mining machinery, timber, and general supplies; develop additional water supplies for mining; and permit miners to drive tunnels, repair sluices, and refit their mines as soon as it is assured that the debris will be stored at a reasonable price and that hydraulic work may be resumed with protection to farm lands below.

Mr. Jarman estimates that \$905,000 will provide dams for 20 years of hydraulic mining on the Bear and American Rivers and that gold production from this work will exceed \$8,000,000 in that time. He recommends that storage be purchased in a dam to be constructed by a private company at the Narrows site on the Main Yuba River, which will develop hydroelectric power. It will enable the mines to work on the South and Middle Yuba Rivers, the production on which for 20 years is estimated at \$14,000,000.

Japan Abandons Proposed Steel Tariff

Proposed legislation increasing the import duties on certain articles of iron and steel in Japan has been definitely abandoned, according to advices to the Department of Commerce.

Vindicator Mining Company Wins Suit

The Supreme Court of Idaho has confirmed the decision of the district court of Shoshone county in favor of the defendant in the case of the Buckeye Mining Co. vs. Vindicator Mining Co., involving the ownership of the Vindicator group of claims, situated about two miles east of Mullan. The claims were located many years ago and are among the oldest locations in the Hunter mining district. The ground was relocated by the Buckeye company which claimed that the Vindicator company has forfeited its rights through failure to do annual assessment work, and suit was brought to establish title about two years ago.

Oil and Gas Regulations on Indian Reservations

On March 15 the Secretary of the Interior approved regulations putting into effect the act of March 3, 1927, which authorizes the leasing for oil and gas mining purposes of unallotted lands within Executive Order Indian reservations. Existing regulations applying to treaty reservations are made applicable to all leases except those executed under section 5 of the act, which, under conditions outlined therein, gives the secretary authority to issue exploratory permits and leases to persons who prior to May 27, 1924, had applied for a permit under the general leasing act. Applicants desiring to take advantage of the provisions in section 5 must, on or before June 1, 1927, surrender any permit granted them under the general leasing act, apply for a new permit, and furnish evidence showing that they have met the conditions prescribed in the section.

Insurance Rates Increase

After litigation lasting since last July, the Federal court at Louisville, Ky., has decided that the fire insurance companies operating in Kentucky could increase fire insurance rates by 12½ percent, provided the money secured from the increase is impounded, or bonded, so that it can be paid back, in event similar suits from Missouri and Arkansas, now before the United States Supreme Court are decided against the companies.

Under state laws the companies have no right to increase rates, without permission from the state departments. But the companies hold that present rates are confiscatory, as they have lost large sums over the past five years, and as the companies are non-state companies, they carried their troubles to the Federal courts, after being defeated in the state courts.

This will mean a considerable increase in operation costs for the coal trade of the state, in covering physical property, which is subject to fire hazard.

Land Offices Consolidated

Effective July 1, the Interior Department will discontinue land offices at Montgomery, Ala., Baton Rouge, La., and Guthrie, Okla., the work to be taken over by the General Land Office in Washington, D. C.

The San Francisco Land Office will be consolidated with that at Sacramento, and the Visalia Land Office will be merged with the Los Angeles. The Glenwood Springs Office will be consolidated with the Denver; the Boise Office with the Blackfoot Land Office in Idaho; the Elko Office with the Carson City, Nev., Office; the Portland and Lakeview Offices with the Roseburg Land Office and the Vale with the Dalles Land Office in Oregon. The Vernal will be consolidated with the Salt Lake Land Office; the Seattle with the Spokane Land Office, and the Lander Office with the Evanston Land Office in Wyoming.

Nova Scotia Mining Proposals

A bill to stimulate gold production, under consideration in the Nova Scotia Legislature, would exempt gold production from payment of the regular 35 cents per ounce royalty for the next five years, reduce the fees for prospecting, increase the size of lease holdings from 6 to 20 acres, and abolish the regulation demanding that applicants for prospecting areas furnish bond to cover possible damage claims made by holders of surface rights.

To Report on Fluorspar

The report of the Tariff Commission on its investigation of imports of fluorspar may be announced shortly. The present duty is \$5.60 per gross ton and under the flexible provisions of the tariff act a 50 percent increase is possible. West of Columbus, Ohio, freight rates are such as to keep out foreign material, but imports dominate the seaboard markets. A fifth of the material consumed at Pittsburgh is imported.

Burton Coal Co. Wins Suit

A decision of the United States Supreme Court has confirmed a judgment of \$445,528 awarded to the Burton Coal Co., of Chicago, against the U. S. Government.

This case grows out of a contract signed with the Burton Coal Co. in 1920 by Government officials for the furnishing of coal to a number of army posts. When market prices slumped during the life of the contract, shipments of coal by the Burton company were refused by Government agents, and the coal needed at the posts purchased in the open market. Suit was brought under the contract in the District Federal Court, where judgment for this amount was awarded.

Berwind-White Acquires Ephraim Creek Properties

Over 7,000 acres of coal lands at Thayer, W. Va., belonging to the Ephraim Creek Coal & Coke Co., have been acquired by the New River & Pocahontas Cons. Coal Co., a subsidiary of the Berwind-White interests, and will be under the direct supervision of P. C. Thomas, division superintendent of all mines in that section, with headquarters at Fayetteville. With this acquisition, the New River & Pocahontas Co. becomes the largest coal land owner and producer in Fayette County. The combined holdings at Layland, Minden, Kaymoor, Wierwood and Thayer is now in the neighborhood of 42,000 acres with an output of approximately 6,000 tons a day. Investments of the Berwind-White interests in Fayette County mining property are now in excess of \$10,000,000.

Iowa Mine is Sold

Rex No. 5, one of the best coal mines in Iowa, has been purchased by William Flynn, of Albia, from the Rex Fuel Co., of Oskaloosa, Iowa. The mine, which has a daily capacity of 2,000 tons, has been shut down for more than a year. Mr. Flynn is operating Rex Mine No. 4, which he bought from the Rex Fuel Co. last spring.

North Jellico Leases Mines and Plant

The North Jellico Coal Co., Louisville, Ky., has completed negotiations for leasing its mining plant at Wilton, Knox County, to Adkins and Clupp, Knoxville, and Green, of Harlan. The new owners take over approximately 2,000 acres around the Wilton plant and all mining equipment and houses. They will organize a company to operate the plant. The Wilton mines were opened 20 years ago and coal unmined will assure several years' additional run.

Stewart New President of Davis Coal & Coke Co.

Arthur B. Stewart, for many years vice-president of the Davis Coal & Coke Co., with headquarters at Baltimore, Md., has been named to succeed the late A. W. Calloway, of Philadelphia, as the president of the Davis Coal & Coke Co.

Monongahela Valley Coal Association

Officers of the Monongahela Valley Coal Association were elected at a meeting of the board of directors at Fairmont, W. Va., recently. C. H. Jenkins, long active in association circles in northern West Virginia, was named as president; A. L. White, of Clarksburg, as vice president; and John A. Clark as treasurer. Howard W. Showalter, Fairmont, of the Continental Coal Co., was elected as a member of the board of directors.

CARNEGIE TECH TO HOLD SECOND COAL CONFERENCE IN 1928

A SECOND International Conference on Bituminous Coal will be held at the Carnegie Institute of Technology in November of 1928, according to an announcement by Dr. Thomas S. Baker, president of the institution. The statement is contained in recently issued volume of proceedings of the first conference held from November 15 to 18, of last year.

"We are so greatly encouraged by the success of the first International Conference on Bituminous Coal, held at the Carnegie Institute of Technology last year," he states, "that we have definitely decided to hold a second and similar international congress two years from now."

The first conference, which was called by President Baker for the purpose of finding new uses for bituminous coal and especially to discuss the problem of liquefying coal to supplement the petroleum oil supply of the world. More than 1,700 delegates, including representatives of 13 different countries, attended. The speakers included Dr. Friedrich Bergius and Prof. Franz Fischer, who have successfully liquefied coal; Gen. Georges Patart and Jean Bing, of France; Dr. C. H. Lander, Geoffrey M. Gill, Harald Nielsen, and Dr. R. Lessing, of England, and several other well known foreign scientists in addition to a long list of prominent American engineers and men of affairs and science.

President Baker stated that the second conference will be planned to uncover whatever new information is made available during the coming two years regarding various problems in the use of soft coal.

Anthracite Service Bureau Enters Chicago

C. W. Hare, manager, and C. A. Connell, chief of the staff of engineers, of the Anthracite Service Bureau, were in Chicago recently, conducting a survey to determine the best methods of extending the Anthracite Service Bureau activities to Chicago in an endeavor to increase the consumption of hard coal in this market. S. D. Warriner, chief of the Anthracite Conference, during his visit to Chicago for the Chicago Coal Merchants Association's annual banquet, uncovered many facts about the hard coal situation in Chicago in his interviews with the various retail dealers whom he met. A few weeks ago a group of Chicago retailers, while in New York, called upon representative anthracite shippers and suggested several changes in marketing methods as a means of increasing sales. This visit of Mr. Hare and Mr. Connell is the result of promises made upon that occasion and is the forerunner of active efforts to provide service in the Chicago market by the anthracite interests.

There is a strong likelihood that the Detroit, Toledo & Ironton Railroad, the Ford-owned line, will be extended from Chillicothe, down the Scioto Valley to Harlan County, Ky., to tap rich coal lands in that county as well as in Pike County, Ohio. A survey of the proposed line is now being made, and upon its result will depend the decision of extending the line.

Low Temperature Carbonization Plant in Canada

Application is expected shortly to be made to Parliament for a federal charter for a \$3,000,000 corporation for the operating in Canada of low temperature carbonization processes of Canadian slack coal, a process which has been made commercially successful in the old country, but new to Canada. It is claimed by the promoters that a new and definite contribution toward a solution of Canada's fuel problem will be made by this process.

According to one of Canada's fuel experts, the carbonized coal produced from slack coal by the new process will be a fuel equal to the best anthracite at present on the Canadian market. It will be smokeless and it is claimed that \$13 a ton will be the maximum cost to the consumer. Oil and gases as by-products of the process will provide sources of income to the corporation.

The process of low temperature carbonization converts all types of bituminous coals into smokeless fuels, and both Nova Scotia and Alberta coals can be successfully treated.

Plans are practically complete for the construction of two 1,000-tons-per-day plants in western Ontario and one in Ottawa of similar capacity, as a beginning. These plants will be operated by subsidiary companies. Steps are being taken also for the organization of similar subsidiary companies in Montreal and Quebec for similar plants.

Madeira, Hill & Co. Makes Extensive Operating Improvements

At Lawrence Colliery, of the Hurleigh-Brookwood Coal Co., a subsidiary of Madeira, Hill & Co., a new level has been opened on the 435th plus elevation, by a slope in one of the over-lying measures, driven off the 640th elevation. Tunnels have been driven across the basin and the water in the old Mammoth workings between the 435th and 640th elevations has now been removed.

The dewatering of the Mammoth old workings, on the 640th elevation, completed about 1917, required approximately one year. The dewatering of the similar workings on the 435th elevation required but two months' time. Greater progress was made by reason of the fact that the old workings were approached with less interval of rock, resulting in less difficulty with blockage of gob in the bore holes. It is expected that during the ensuing year the 435th elevation at this old colliery will be a considerable factor in the production of Lawrence operation, which is now shipping in excess of 40,000 tons a month, full working time.

It is intended to drive a slope up from the 435th elevation to connect with the main hoisting slope, now operating only to the 640th elevation. When this is completed the present hoist, which was designed to hoist the coal from the 640th and lower elevations, will enable the company to eliminate the slope put down in the over-lying vein to develop and dewater the lower or 435th elevation.

The opening of the new level will also afford some insurance against the drowning out of the present active working levels.

More Coal Carrying Capacity in Lake Fleets

The Pittsburgh Steamship Company is fitting out its coal and ore fleet which will have considerable more cargo capacity this season than heretofore. J. S. Ashley, president of the Lake Carriers' Association, points out that the lake bulk freight, largely coal and ore, in 1926, attained a new high record for tonnage, the total being 121,289,000 tons. In view of the late opening of the navigation season, he says the record was phenomenal.

Since 1923 there have been brought into the coal and ore fleets 24 bulk freighters with a total trip capacity of 290,000 tons, or an average of 12,100 for each ship, while the eliminations were 12 steamers, with a trip capacity of 3,425 each and a total of 41,000 tons, showing the great increase in carrying capacity of new steamers added to the coal hauling fleets on the Great Lakes.

Lake and Export Coal Corp. Takes Over Glendale Collieries

The Lake and Export Coal Corp., of New York, has completed negotiations with Scranton operators whereby they will take over the entire output of Glendale Anthracite Collieries of Scranton. The mines of the Glendale Co. represent one of the largest independent holdings of high grade anthracite in the Pennsylvania fields at the present time. Daily production approximates 1,000 tons, and additional equipment is being installed with a view to increasing production to 1,500 tons in the near future. The mines are located at Jessup and Peckville.

Harry E. Moran is president of the Lake and Export Coal Corp.; A. N. Neiman is vice-president and general sales manager, and Richard R. Conant, vice-president and treasurer.

B. B. & D. C. Mines Purchased

A deal has been closed by McDowell County, W. Va., men for the purchase of the mines, equipment, etc., of the B. B. & D. C. Coal Co., at Williamson, in the Mingo field. Those interested in the purchase were H. L. Bailey, O. M. Terry, John D. Kennedy, of Bradshaw, and W. H. Day. For some time the company has been producing about 400 tons a day.

The Cranberry Creek Coal Co. is preparing to build a 42-in. pipe-line storm sewer which will carry the waters of Cranberry Creek across a wide space that is to be stripped for anthracite in veins that reach the surface in the Cranberry section of Luzern County, Pa., and are reputed to be rich. The sewer will prevent storm waters from flooding the strippings.

Salmon & Cowin, Birmingham industrial and mining engineers, are now sinking a rock tunnel 8 by 21, 250 ft. deep, to reach the coal basin at the Connellsville mine of the Yolande Coal & Coke Co. The contract for the new steel tippie at this opening has been awarded to the Steward Machine Co. Work of sinking a manway and air course will be started in the near future.

The McClane Mining Co., at Washington, Pa., which suffered from a fire that destroyed its tippie some time ago, has awarded contracts for a new steel tippie and equipment for that mine, including automatic screens, picking tables, etc., and with a much larger capacity than the old plant. A temporary tippie is doing service pending the new construction work.

No Massachusetts Coal Survey

The proposed appropriation of \$50,000, to be expended in securing engineering and geological data regarding the purported coal fields of southeastern Massachusetts, failed recently when an adverse report was brought in by the Committee on Ways and Means of the Massachusetts Legislature.

In addition to a central laboratory, the Pittsburgh Coal Co. has established branch laboratories at five mines for purposes of ash determination. Samples are also checked at the main laboratory. Construction of the new cleaning plant, at Montour No. 10 mine, is well under way. This plant will have a capacity of 325 tons per hour, 2½ inch or smaller.

Slightly more than one-fourth the Pittsburgh vein of coal has been mined in Washington county, Pa., although the mining industry has flourished within its borders for many years. Statistics compiled show that Washington county in the beginning had a total of 495,381 acres of coal lands. Of this, 126,358 acres has been mined, leaving a total of 369,042 acres of virgin coal.

The Colorado Fuel & Iron Co. has announced the appointment of W. A. Maxwell, Jr., as production manager, effective May 1, 1927. This office has been created due to the growth of the business and the increased demands upon the time of the various officers.

Fuel Engineering Course at Penn

The Towne Scientific School of the University of Pennsylvania announces a new one-year course in fuel engineering, opening September 30, 1927, under the direction of Prof. R. H. Fernald, leading to the degree of Master of Science in Fuel Engineering. Professor Fernald will be assisted by 51 prominent engineers and instructors, the former being drawn from men directly engaged in fuel production or associated industries. In addition to the fundamental subjects of fuel resources and the methods of mining, preparing, storing, and distributing fuel, the course will embrace fuel composition and combustion; the manufacture of special fuels; uses of fuels and specifications for purchase; fuel sampling, analysis and calorimetry; furnaces; fuel testing in heating and power appliances; domestic heating and cooking; smoke elimination; and regulations affecting the use of water power and fuel resources.

The course is intended primarily for those who have had the advantage of a complete undergraduate education of college grade and who have also had practical experience in fields allied to fuel engineering.

North American Co. Issues Ultimatum to Lewis

Frank E. Taplin, president of the North American Coal Co., has advised John L. Lewis that if he does not have a contract by April 1 that will enable him to meet competition with other districts and in his own district at Pittsburgh, he will open his Ohio mines April 2 on a non-union basis and follow the rule of the Pittsburgh Coal Co. in the future. The North American Co. produce in Ohio, Pittsburgh, and West Virginia upwards of 1,000,000 tons a month.

Ohio Mines to Close Unless Wages Are Lowered

A meeting of the Eastern Ohio Coal Operators' Association, successor to the old Pittsburgh Vein Operators' Association, was held in Cleveland, March 18. It developed at the meeting that at least 131 deep mines in the eastern Ohio section will cease to function, April 1, unless a competitive scale is accepted by the union miners. About 60 of these mines are now operating.

D. F. Hurd, secretary of the association, at the close of the meeting, said:

"In contrast with Ohio's production of 29,000,000 tons in 1926, against 45,000,000 tons in 1923, nonunion mines in West Virginia last year turned out 147,000,000 tons. Their 1920 production was 89,000,000. In Kentucky, another nonunion field, the output increased from 35,000,000 tons in 1920, to 53,000,000 in 1926. With such trends evident and continuing, caused by the higher wages in Ohio, the Ohio mines are threatened with oblivion.

"The maximum scale for the nonunion fields is \$5.00 a day and in many cases wages are less. With this variation in wages it would be suicidal for the Ohio operators to sign another three-year contract with the miners to continue the Jacksonville agreement of \$7.50 a day."

Rail & River Coal Co. Mines to Suspend Operations

The fifteen hundred men employed by the Rail and River Coal Co. mines, at Bellaire, Ohio, were notified March 10 that the mines of the company would suspend operations on March 31. In its notice to the men the company said:

"As no contract has yet been agreed upon the mines of eastern Ohio will cease to operate with the close of the present month and there will be another period of idleness for the mines and their employees. Which character of scale is best, one with a higher rate that all business will accrue to other fields, or one of a competitive character that will insure steady employment and good earnings, is something for all of us to think about. Under the present scale, West Virginia coal can be delivered at from 35 to 50 cents a ton less than Ohio."

Dust Hazard Discussed

THE most important dust hazard today arises from the use of pneumatic tools, such as jackhammers, in mining," Dr. Edgar L. Collis, professor of preventive medicine at the University of Wales, declared in the first of a series of two public lectures delivered at the Carnegie Institute of Technology in Pittsburgh on March 14 and 15.

In lecturing on "Industrial Dusts," Dr. Collis pointed out that while the use of pneumatic tools is causing the most important dust hazard of the present day, recent devices for catching the dust generated are now available. The air escaping from the tool is used, on the ejector principle, to actuate an exhaust current of air which draws away the dust and carries it to a flannel-bag filter. The principle employed in this device when generally applied, he said, should make pneumatic tools safe to use and remove much of the silica-dust hazard from the mining industry.

Dr. Collis spoke of his own investigations in British industries and claimed that dusts differ in their effects on the human lungs. "For the most part," he said, "dusts of animal origin are fairly harmless and so are most of vegetable origin dusts, such as coal and flour; but vegetable husks from cotton and flax set up a tendency to bronchitis and pneumonia and also to spasmodic asthma.

"Dusts composed of materials found in the human body and soluble in the body juices seldom cause trouble. But dusts which are insoluble in the body, if large, cause bronchitis and, if minute, pneumonia." Among these Dr. Collis grouped such things as carborundum, emery, and glass. One dust, that of silica, arising from flint, quartzite metalliferous rocks, sandstones and granites, was placed in a special class. It originates bronchitis, when the particles are large, and pneumonia when minute; but it slowly dissolves in the lungs and changes them from elastic, spongy organs into tough, rubber-like material. Such material, he pointed out, readily falls victim to tuberculosis infection.

The British scientists referred to experiments which showed how tubercle bacilli multiply in tissues damaged by silica, but not by other materials. These experiments conclusively prove, he said, that silica dust exerts its harmful influence by passing into solution and reacting chemically upon the lung tissues.

The need for plenty of water to drink in hot mines and for introducing a small amount of salt into the water, which prevents muscular cramp and freshens the workers, was stressed by Dr. Collis in discussing the "Human Factor in British

Coal Mining," in his second lecture of the series of two. He also drew attention to the need of a different standard of ventilation in hot and humid mines for the miner to that needed to guard against the explosion risk.

Industrial diseases resulting from posture at work and careless use of picks could be prevented to a great extent, Dr. Collis believes, if as much attention was paid to instructing miners how to work and use their bodies as is paid in the field of sport. Such instruction when applied in industry increases earning power, he declared.

Regarding industrial diseases for which compensation is paid, Dr. Collis said that over a quarter million British miners monopolize over 90 percent of all claims. "First and foremost stands nystagmus," he said, "a disease fortunately unknown in America, followed by localized blood poisoning at the knee, the hand, and, by inflammation, over the elbow and at the wrist. These four diseases result from posture at work and careless use of picks."

Coal dust was claimed not to be injurious, but warning was given as to the kinds of inert dust to be used for dusting roadways and galleries to prevent explosions. Limestones are safe, he said, but silica dusts should not be used. Deaths from explosions are mostly caused by carbon monoxide gas, Dr. Collis emphasized, and the rescuers must be provided with apparatus to prevent them being overcome.

More than most other workers, Dr. Collis said, miners require baths, and such are now being installed in England on a new model. Previously that country had been badly equipped in this respect. The claim was made that many accidents among miners depend on the personal factor; the mortality from accidents was shown to vary with other causes of mortality and so apparently to be associated with general health.

Similarly, he pointed out, the records of strike ballots exhibited the greatest unrest on the coal fields with the highest mortality. The lecture, which was illustrated throughout, closed with some description of the welfare scheme now in action in Great Britain under which \$5,000,000 annually are being expended.

The International Railway Fuel Association this year is planning to make their nineteenth annual meeting the greatest meeting in the history of the association. It is to be held at the Hotel Sherman, Chicago, May 10, 11, 12, and 13. President E. E. Chapman has secured prominent speakers from several of the largest railroads in the country, and the officers are looking forward to a large attendance.

Prevention of Lead Poisoning in Mining of Lead Ores

The prevention of lead poisoning in mining resolves itself into two separate responsibilities, those devolving upon the company and those devolving upon the employes, says the Bureau of Mines.

The company responsibilities are primarily to maintain working conditions in which the lead hazard is reduced to the lowest degree possible by observing the following precautions:

Underground drilling to be wet.

Piping an adequate supply of water to all working faces.

Sprinkling muck piles thoroughly before loading.

Blasting only at end of shift.

Adequately ventilating every working place in the mine.

The company responsibilities, says the bureau, not only require that facilities be provided for carrying out these precautions, but that through strict supervision proper uses be made of these facilities by employes, so as to keep the mine atmosphere as free from dust as is possible.

Having reduced the lead hazard to the lowest possible point at its source, the company has the further responsibility of providing measures such as the following to offset any exposure to lead as may still occur: A good change house having plenty of hot and cold water, with an average of one shower to every 10 employes; a good medical service, including periodic examinations of all employes by which men showing the least suspicion of lead absorption can be placed under observation and treatment at the earliest possible time; shifting men showing suspicious signs of lead absorption to sections of the mine with less lead hazard, or to surface work; and education of employes as to the ways and means of warding off lead poisoning.

The responsibilities of the employes are, first, cordial cooperation with the company in its efforts to limit the lead hazard under ground; and, second, the practice of certain rules of personal hygiene and habits, including:

Keep body clean.

Bathe at end of each shift and change to street clothing.

Change and wash work clothes frequently.

Wash hands before eating.

Never eat food in a dusty atmosphere.

Rinse mouth before eating.

Eat a substantial meal before reporting for work.

Eat plenty of nutritious food.

Keep body excretions free. Do not permit yourself to become constipated.

Avoid all excesses, particularly alcoholic beverages.

Consult company physician at first sign of ill health and report for periodic examinations regardless of how well you feel.

MINES AWARDED CERTIFICATES FOR EXCEPTIONAL SAFETY RECORDS

INSTANCES of the operation of mines over long periods of time with exceptional safety have been commemorated by the Holmes Safety Award Committee, of the Joseph A. Holmes Safety Association, in the awarding of certificates to two coal-mining operations whose records show the production of great tonnages of coal without a fatal accident and to a metal mine and a stone quarry where no employe lost even as much as a day's time because of injuries.

A certificate was awarded to No. 6 mine of the United States Coal & Coke Co., at Gary, W. Va. This mine was operated for a period of almost 10 years, from February 24, 1917, to December 31, 1926, without a fatal accident. During this period 606,072 man-shifts, or approximately 5,455,000 man-hours, were worked by the underground employes of the mine, and 214,667 man-shifts, of approximately 1,932,000 man-hours, were worked by the surface employes of the mine. The production of coal during this time amounted to 6,030,862 short tons.

The Benjamin, Francis, and Berry coal mines, of the Ford Collieries Co., at Curtisville, Pa., were awarded a certificate in recognition of their operation for a period of more than six years, from August 14, 1920, to December 31, 1926, without a fatal accident underground, and from October 10, 1922, to December 31, 1926, without a fatal accident above ground. Since the last fatality underground, the underground employes of these three coal mines have worked 922,628 man-shifts, or approximately 7,381,000 man-hours, and have produced 5,755,669 short tons of coal. Since the last surface fatality, the production of coal has been 3,705,669 short tons, and the employes, underground and surface, have worked 628,481 man-shifts, or approximately 5,008,000 man-hours.

In the metal-mining field, a certificate was awarded to the Muncie zinc and lead mine operated by the Federal Mining & Smelting Co. at Baxter Springs, Kans. This mine was operated from July 23, 1925, to December 31, 1926, not only without a single fatal accident but without a "lost-time" accident underground. A "lost-time" accident is one in which the injured worker loses at least a full day's work as the result of the accident. A total of 39,489 underground man-shifts equivalent to 315,912 man-hours was worked during this time without a "lost-time" accident.

In the quarrying field a certificate was awarded to the Speed open limestone-rock quarry operated by the Louisville Cement Co. at Speed, Ind. No fatal accidents and no "lost-time" accidents occurred at this quarry during a period of more than

two years from June 1, 1924, to December 31, 1926, a period totaling 545,497 man-hours, or 60,611 man-days.

The Joseph A. Holmes Safety Association is an organization named in honor of the first director of the United States Bureau of Mines, now deceased. Its principal aim is to further the cause of safety among the million miners of the United States, Dr. Joseph A. Holmes having been conspicuous in the inauguration of the organized mine-safety campaign in this country. The association includes in its membership the Bureau of Mines, a considerable number of scientific and engineering societies, and various mine operators' and miners' organizations. The Holmes Safety Award Committee meets annually to award certificates in recognition of exceptional safety records made by mines and quarries.

The awards just made, according to Dr. R. R. Sayers, chief of the Health and Safety Branch of the Bureau of Mines, and acting secretary of the Joseph A. Holmes Safety Association, are not necessarily meant to be in recognition of the best safety records made by mines and quarries, but are intended rather to commemorate exceptionally meritorious safety records which have come to the committee's attention. The committee, Dr. Sayers stated, would be glad to have brought to its attention noteworthy safety developments.

Goggles Save Eyes

The Annual Safety Report of the Colorado Fuel & Iron Co., Fuel Department, issued in January, 1927, has this item:

"Goggles have proven their worth; eye injuries have been reduced about 60 percent since their installation. Some of the 26 eye injuries that occurred in 1926 could have been avoided if the injured men had not tried to get along without their goggles.

"Men who attempt to beat the goggle rule are only hurting themselves. It was for their own protection that goggles were installed, and it is for their protection that we are insisting on their use.

"The large reduction in eye injuries, dating from the time goggles were first used, convinces us that practically all eye injuries can be eliminated, and each eye injury in 1927 will be carefully investigated.

"The present goggle rule is:

"Any employe found working at the face without goggles by underground officials will be suspended for three days for the first offense, six days for the second offense, and discharged if violation occurs the third time within 60 days.

"Further, that where eye injuries occur at places where goggles should be worn, the company will seek to have compensation reduced 50 percent on account of rule violation."

Mining Section Meeting, National Safety Council

The National Safety Council has released its preliminary program for the meeting of its mining section, to be held at Chicago, September 27-28-29, 1927. The papers so far scheduled include the following:

Statistics and Their Bearing on Accident Prevention—H. G. Hensel, safety director, Youngstown Sheet & Tube Co., Chicago, Ill. Discussion of paper: (1) W. W. Adams, United States Bureau of Mines, Washington, D. C. (2) R. V. Ageton, Tri-State Zinc & Lead Ore Producers Association, Miami, Okla.

Review of the Work of the Mining Section Since its Inception—R. Dawson Hall, editor, Coal Age, New York, N. Y.

Foremanship Training Conferences and Their Bearing on Accident Prevention—McHenry Mosier, superintendent of mines, Phelps-Dodge Corporation, Morenci, Ariz. Discussion of paper: (1) Joseph M. Hall, regional agent, Federal Board for Vocational Education, Washington, D. C. (2) C. A. McDowell, assistant manager, Pittsburgh Coal Co., Pittsburgh, Pa.

Accident Prevention in its Broader Phases—Eugene P. McAuliffe, president, Union Pacific Coal Co., Rock Springs, Wyo.

The Effects of Mine Dust on Health—Dr. F. V. Meriwether, United States Bureau of Mines, Miami, Okla. Discussion of paper: (1) J. L. Boardman, safety director, Anaconda Copper Mining Co., Butte, Mont. (2) Daniel Harrington, United States Bureau of Mines, Washington, D. C.

Round Table Discussion: "Ventilation," "Blasting," "Haulage," etc. Leader—Frank Pollock, safety engineer, Oliver Iron Mining Co., Eveleth, Minn.

Form Safety Clubs in New River District

It was recommended at a recent meeting of the New River district safety committee, held at Mount Hope, W. Va., that each of the companies belonging to the New River Coal Association organize a safety club to be composed of mine officials and employees. These clubs will work in cooperation with R. M. Lambie, chief of the state department of mines, and they will meet with the local mine inspectors at Mount Hope regularly once a month. The New River district safety committee is composed of Edward Blackwell, of the New River Co., chairman; J. W. Garvey, of the Maryland New River Co.; Guy S. Dooley, of the Loup Creek Colliery Co.; J. B. Morne, of the Stonega Coke & Coal Co.; Robert Thompson, of the Raleigh Coal & Coke Co.; and F. E. Brown, of the South Side Co.

TIMBER PRESERVATION

(Continued from page 311)

3. Any mine, even the smallest, can easily afford the expense connected with the open tank treatment, including the cost of the plant and the treating costs, whereas the cost of pressure treating plants for many mines would be unwarranted for many reasons. Considering that much of the plant labor is not busy 100 percent of the time and considering the small amount of labor required in connection with open tank treatment, no additional labor expense would be involved in a great number of cases, the tippie crew or other plant labor usually being able to apply the treatment during their spare time.

4. Most any of the commercial preservatives can be used with the open tank method.

5. The total treating cost is nominal, adding but slightly to the initial cost of the timber. Assuming timber at a cost of \$30 per thousand feet delivered (36 cents per cubic foot), and adding 20 cents as the treatment cost, the total cost ready for use would only be 56 cents per cubic foot, and the timber would have a life of 10 to 15 years or longer as against a life of 1 to 5 years in its untreated state. The economy of the treatment is obvious.

Experimentation with wood preservatives has developed the fact that generally, seasoned timber responds better to treatment than unseasoned, the reason probably being that the higher moisture content of unseasoned timber prevents absorption as great as seasoned timber, therefore giving a shorter life. The writer has also observed in many instances that green or unseasoned timber brush-coated with coal-tar creosote began to check and split badly during the seasoning process in the structures where used. It is an economic policy to stock at least a six months supply of timber so as to permit seasoning for at least that length of time before applying the preservative treatment.

In the mining industry it is not profitable to treat all timber used. Ties, cross bars, gangway or heading timbers, stoppings, etc., where the timber is expected to give a three-year life or longer, or placed under conditions where it will be salvageable, can be profitably treated. Since rock dusting has come into general use, the writer has found many instances where rock dust barriers constructed of untreated timber decayed within a year; whereas open tank treated timber barriers show no signs of decay at the end of three years. Mine props are not generally treated by reason of their short life, breakage, and the loss sustained by reason of the impossibility or impracticability of recovering them. Since mechanical methods are being applied to mining a recovery of 75 to 90 percent

of the room props is not uncommon, making treatment at least a matter for consideration. With the growing scarcity of hardwoods, especially white oak, for mine use, preservative treatment opens the possibility of substituting less expensive softer woods.

There is no question or doubt about the economy of preservative treatment. The American railroads are saving millions of dollars annually and the mining industry has now reached a point where the annual savings are becoming enormous. Treatment will not only return large dividends directly by reducing the timber requirements and the labor cost of replacements, but will relieve the drain on the timber reserves and consequently help to stabilize prices to such an extent that the upward trend will at least be more gradual. Reforestation is now being practiced by some of the larger companies. This policy combined with preservative treatment can be expected in time to effect a balance in which timber costs will assume a comparatively fixed figure for companies maintaining a sufficiently large forest reserve.

STATEMENT OF THE OWNERSHIP, MANAGEMENT, CIRCULATION, ETC., REQUIRED BY THE ACT OF CONGRESS OF AUGUST 24, 1912,

OF THE MINING CONGRESS JOURNAL, published monthly at Washington, D. C., for April 1, 1927.

City of Washington,
District of Columbia, ss:

Before me, a notary public in and for the state and county aforesaid, personally appeared R. S. Mowatt, who, having been duly sworn according to law, deposes and says that she is the assistant business manager of the MINING CONGRESS JOURNAL, and that the following is, to the best of her knowledge and belief, a true statement of the ownership, management, etc., of the aforesaid publication for the date shown in the above caption, required by the Act of August 24, 1912, embodied in Section 411, Postal Laws and Regulations, printed on the reverse side of this form, to wit:

1. That the names and addresses of the publisher, editor, and business managers are:

Name of publisher, The American Mining Congress; post-office address, Washington, D. C.

Editor, E. R. Coombes; business manager, Burton Bunch.

2. That the owners are (give names and addresses of individual owners, or, if a corporation, give its name and the names and addresses of stockholders owning or holding 1 percent or more of the total amount of stock): The American Mining Congress—a corporation, not for profit. No stockholders. Wm. H. Lindsey, president, Nashville, Tenn. Robert E. Tally, first vice-president, Clarkdale, Ariz. George B. Harrington, second vice-president, Chicago, Ill. H. W. Seaman, third vice-president, Chicago, Ill. J. F. Callbreath, secretary, 841 Munsey Bldg., Washington, D. C.

3. That the known bondholders, mortgagees, and other security holders owning or holding 1 percent or more of total amount of bonds, mortgages, or other securities are (if there are none, so state): None.

R. S. MOWATT,

Assistant Business Manager.

Sworn to and subscribed before me this 29th day of March, 1927.

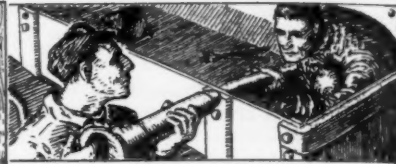
[SEAL]

THOMAS C. WILLIS.

(My commission expires January 4, 1932.)



WITH THE MANUFACTURERS



A Notable Mileage Record for Hyatt Journal Bearings

It is rather unusual for a railroad car to run 300,000 miles on one set of journal bearings. Yet this is the mileage to date of a 12-wheel coach on the Chicago, Milwaukee & St. Paul Railroad.

Every nine days this car makes a round trip between Chicago and the west coast. Summer and winter it has been rolling up big daily mileages.

Hyatt Roller Bearings in four-motion boxes are used on all axles. A recent check up on bearings showed them to be in perfect condition, free from wear or other signs of destruction.

Considerable speculation is rife as to probable mileage these bearings will deliver. Engineers who are familiar with the installation declare that double the present mileage is a conservative estimate.

This anticipated 600,000 miles is about ten times average plain bearing life in this sort of service.

That is one reason so many railroads are installing antifriction bearings on trial cars, to determine to their own satisfaction how well such bearings meet requirements of their particular service. Many other cars running in steam, gas, and electric service have rolled up big mileages and low costs per mile in maintenance.

It is interesting to note strides made in the application of roller bearings to gas rail cars and high-speed electric railways. As an example, a new subway under construction in an eastern city will soon place into operation a 10-car train so equipped, and will no doubt go in extensively for roller bearings if this train "delivers" as expected.

One of the most important assets of roller bearings in railroad service is their low starting torque. Translated in terms of utility, a locomotive that starts with effort a 10-car train equipped with plain bearings can start twice that number equipped with roller bearings.

From this standpoint it may be readily seen that roller bearings for short-haul service actually promote faster schedules.

Another important betterment involves lubrication. Weekly check up on the oil level, with addition of about a half gill of lubricant, is the only requirement of roller bearings. Contrast this to perpetual oiling inherent with brass—repacking of waste—and replacing lost box lids.

Progressive railroad men throughout the country have conducted exhaustive tests during the past few years which have satisfied them of the many points of superiority of anti-friction types.

Often the prediction is made that roller bearings will dominate the passenger car field, at least within another decade. Those who have closely followed experimental installations over a period of years, especially jobs like the St. Paul, are in harmonious agreement with this prophecy.

Meanwhile the larger and up-to-date roads like the Chicago, Northwestern and Rock Island, are ordering cars in quantity equipped with roller bearings, to the satisfaction and deep interest of engineers and the public alike.

New, Concealed Type Bond Is Applied to the Edge of Rail Base

Where conditions are favorable in the mine, a very desirable type of bond is one that may be welded to the base of the rail in such a way that it is practically all concealed. The combination of this protection from dragging equipment and derailed cars, with provision for easy welding, has been secured in the New AW-15 copper alloy weld bond just announced by the Ohio Brass Company.

The terminals are a modification of the ones used on this company's type AW-12 bond, which is applied on top of the rail



base. The new bond terminals have hooks which engage with the edge of the rail, being designed to grip rails up to 30 pounds. In application, the cable takes a position underneath the rail, the only exposed part being the welding area of the terminal. Welding is done with copper alloy rod and the electric arc. Extension of the cable strands well into the terminal assures complete fusion of each strand into the deposited metal.

Being a short bond (7-in. cable), only a few inches of rail at the joint is spanned. Simplified application and a minimum of copper make for a minimum in cost of installation.

The manufacturer recommends use of the bond only where excessive corrosive conditions will not result from the position of the bond underneath the rail. The bond can be applied where the splice plate does not cover the edge of the rail base, but not with angle bars.

New Small-Sized Gas Engine Driven Welder

The General Electric Co. announces another addition to its line of welding equipment, a small engine driven welding outfit. This set incorporates the G. E. WD-11 welding generator with a continuous rating of 150 amperes and a one-hour rating of 200 amperes, the welding duty range running from 50 to 250 amperes.

The generator is driven by a Continental P-20, power unit rated 18.22 horsepower S. A. E. and capable of developing 23.5 horsepower at 1,400 r. p. m. The generator is equipped with a control panel, rheostat and self-adjusting stabilizing reactor. The engine accessories include a strongly constructed radiator, pressure feed lubricating system with oil pressure gauge and indicator, vertical tube gravity feed carburetor, air cleaner, centrifugal governor, starting crank, 10-gallon gasoline tank, tool box and sheet metal hood with sheet metal side panels which can be locked in place.

The outfit is particularly adaptable for oil field work, shop and garage work where portability is desirable or for any application where no power supply is available for driving a motor generator type of welder.

Among the advantages of this combination are low first cost, light weight and reliability. Tests have shown the outfit capable of standing up under hard service and overloads. The set is mounted complete on a structural steel base so designed as to facilitate easy moving from place to place.

Largest Capacity Steel Melting Transformers

The largest capacity transformers ever built for use with steel melting furnaces will be used by the Timken Roller Bearing Co. in connection with the installation, soon to be made, of two 25-ton melt-

ing furnaces of the Heroult type at Canton, Ohio.

The transformers, now being built in the Erie shops of the General Electric Co., will have a continuous rating of 7,500 kv-a., a short-time rating of 9,000 kv-a., will operate on a 22,000-volt, 3-phase, 60-cycle circuit, and will be of the water-cooled type. Three are being built, two to be used to supply current for the two new furnaces, and the other to be reserved as a spare until an additional furnace is installed.

Mine Safety Appliances Adjustable Roof Supports

The Mine Safety Appliances Co. announce the M-S-A Adjustable Roof Supports for coal mine entries and gangways, which consist of three pieces of channel iron, "nested," pinned together—and all bent to a 20-foot radius to form an arch, adjustable to varying widths of entries. A set-up may be made easily and quickly by one man—no shearing of ribs or cleaning along roadways to get clearance is necessary. And being adjustable, the roof support saves the time required to measure up and cut steel or wood timber.

Traylor Screen

The Traylor Vibrator Co., of Denver, Colorado, have issued a leaflet concerning their "Screen Supreme," which sizes dry or wet material. This screen is said to operate directly from the pulsation of the electric current, and has no bearings, cams, pulleys, and does not require lubrication. This company also produces Traylor Sand Pumps, Traylor Grizzly Feeders, Traylor-Franz Thickeners, Colorado Mine Signals, and The McVicar Oilers. Full information concerning any of their products may be obtained by addressing their Denver, Colorado, office, at 1400 Delgany Street.

A New 3-in-1 Paint Spray

The Alexander Milburn Co., 1416-1428 West Baltimore Street, Baltimore, Md., has developed a 3-in-1 spray gun which is adaptable to very fine work such as painting and lacquering automobiles, furniture, etc., or on coarse operations such as painting machinery, freight cars, etc.

This is a triple purpose gun for use either as a siphon-feed, pressure-feed, or gravity-feed spray. It is immediately adaptable to use by either method, whichever may be more convenient for the work.

The scientific construction of this gun allows it to be used on low air pressure or with an "ordinary garage compressor."

Consistent with the kinds of work encountered, the Milburn multiple-head ad-

justment permits either a flat, fan spray in either horizontal or vertical position or a round spray by a mere adjustment. The atomization is so fine and even that "orange-peel" is eliminated, minimizing sanding and rubbing. The Milburn spray can be so finely adjusted that it can be used for touching up, shading and high lighting. An air pocket, formed by the fan-shaped nozzle, completely surrounds the atomized spray and lessens the loss of material through evaporation and utilizes the entire spray in thoroughly covering the surface. When dusting is desired, a trip lever is raised, allowing the air only to function and completely shutting off the paint supply.

Both the air and paint valves are operated simultaneously. By pulling the trigger paint flows to the atomizing chamber, is expanded and driven with ample force into the pores of the surface to be covered. Daubing and brush marks are eliminated.

Joints Sealed Against Oil Leaks by New Paint

A paint which is said to be the only material that effectively seals joints against oil leaks has been developed by the General Electric Co. and is sold by the Merchandise Department at Bridgeport, Conn. The product, known as G-E No. 880 Red Protective Paint, also prevents water and gas leaks. It can be used for many purposes which require red lead or white lead, and is less expensive than either.

Warning Signal Sounds When Lubricating System Fails

The Power River Company, of Vancouver, Canada, has installed a combination of General Electric control devices and warning signals to prevent failure of the lubricating system for its electric generator, and to prevent overheating of the generator thrust bearing. On failure of the oil pump, a spare pump is immediately started and an industrial signal sounded, and a signal sounds when the thrust bearing overheats.

The oil pump which is regularly used during the operation of the generator is driven through gearing from the generator shaft. An independent motor-driven oil pump is also provided with an equipment for hand starting. Should the geared pump fail to operate, the motor-driven pump will go into service automatically.

A General Electric pressure switch is installed in the discharge side of the geared oil pump. With this arrangement, if the pressure of the geared pump drops, the pressure switch closes a magnetic switch and thus starts the motor-driven pump. The second pump operates until normal conditions are restored and pressure is again being delivered by the

geared pump, whereupon the pressure switch opens its contacts and the motor-driven pump shuts down. On the closing of the pressure switch an industrial signal sounds. The signal operates on 125 volts, direct current.

The thrust bearing on the generator is equipped with a Tycos thermometer alarm control which operates a 125-volt, direct-current industrial signal. A special wiring scheme had to be arranged because the contacts of the thermometer control are suitable for handling a very low voltage only.

New Carnegie Steel Beams

The Carnegie Steel Co. has placed on the market this year a new series of wide flange beams and column sections, ranging in depth from 8 in. to 30 in. and in width from 6 in. to 16 in. The weight varies from 21 lbs. to 305 lbs. per foot. These sections exceed previous widths by 1 in. and previous weights by 16½ lbs. The beams have no internal flange slope but are of uniform flange thickness throughout their width, increasing the strength of the section and permitting simplified fabrication. By allowing the sections to be used as either beams or columns, variety of sizes needed is reduced and standardization in shop methods and tools is permitted. A more closely graduated range of sizes is offered than has hitherto been available under American standards of production.

These sections are produced at the Homestead works of the Carnegie Steel Co. on a mill that permits many economies of operation and saving in labor costs. Bethlehem Steel Corporation has heretofore been the only producer of this type of wide flange section. The company operates under the Gray patent for the mill and also has patented the type of beam this mill and its modifications produce.

New Shoe Brake Gives Longer Life to Lining

The Electric Controller & Manufacturing Co., of Cleveland, announce the EC&M type WB brake, a new development to meet the demand for a shoe-brake giving longer life of brake shoe linings and permitting quick removal of the motor armature with brake wheel in place without the necessity of taking the brake apart or disturbing any of its adjustments. It is an exceptionally fast operating brake.

The EC&M type WB brake is radically different from any other shoe-brake design in that no levers or rods pass over the top of the brake wheel. The brake shoe arms are caused to operate in opposite directions by means of a simple lever movement having the connecting link within the base below the wheel. This improvement in shoe brake design will be

appreciated by operating departments where time required to change armatures causes costly delays and loss of production.

Steel castings, machined to a high degree of accuracy, and oversize bearing pins assure smooth operation. Brake shoe linings are of asbestos interwoven with wire and moulded to shape under heavy pressure. Linings are $\frac{1}{2}$ inch thick on the smallest size brake and $\frac{3}{4}$ inch thick on the largest size, thus permitting a large amount of wear before replacement is needed.

Their bulletin 1004 describes these brakes in detail and may be had upon request to their Cleveland office.

New Welding Electrode

A new type of welding electrode which combines the characteristics of a fluxed electrode and the quality of bead finish and the cleanness in handling of a bare welding electrode has been introduced by the Merchandise Department of the General Electric Co. at Bridgeport, Conn. Recommended for the general welding of steel, the electrode has a uniform flowing quality. The absence of sputtering or spattering, characteristic of the usual commercial bare welding wire, is one of the features of the new material. The elimination of the erratic arc condition leads to a deposit of more material with the same consumption of electrode per kilowatt-hour. The electrode penetrates quickly and produces high tensile strength and unusual ductility and elongation.

The electrode, which has been designated GE Type F, is furnished in $\frac{3}{32}$, $\frac{1}{8}$, $\frac{5}{32}$, $\frac{3}{16}$, and $\frac{1}{4}$ in. sizes. The standard package is 50 pounds, bur-lapped. It is also furnished on steel reels (approximately 200 pounds) or in coils of approximately 150 or 250 pounds.

Link-Belt Co. Opens New Branch Office at Birmingham

Of interest to the South, and more particularly the State of Alabama, should be the announcement of Link-Belt Co., of Chicago, Philadelphia and Indianapolis, which states that this company will open a new branch sales office at 229 Brown-Marx Bldg., Birmingham, Ala., on March 6. Mr. W. H. Norton, for many years connected with the company's Chicago sales department, will assume the managership of the new territory. The fact that Mr. Harold R. Haight, formerly of Link-Belt's Indianapolis Dodge Plant, "the home of Silent Chain," will assist in the sale of Silent Chain, was also elicited. Link-Belt Co.'s new office may be reached on the telephone at Hemlock 4321.



Air-Driven Portable Hand Saw a Time and Labor Saver

An automatic portable hand-saw, operated by compressed air and doing five times the work of an ordinary saw in the hands of a workman, has been devised by the Ingersoll-Rand Co., 11 Broadway, New York. This saw, now being sold to railroads, building contractors, lumber yards, shipping rooms of manufacturing plants, and other fields of utility, reduces sawing costs from 50 to 75 percent below the cost by the old hand-saw methods.

By a mere shift of blades, the pneumatic hand-saw may be put to work in sawing wood, soapstone, Bakelite, wall-board, cables, copper, and other materials. Cross-cut or rip blades for different types of work are available. It cuts timber; does trimming work on buildings and scaffolding; and it is used by railroads in car repair work. It is as adaptable in its applications as it is economical in its operation.

In sawing wood, the portable air-driven hand-saw can be operated 20 times as fast as a workman can ply his saw, and in this, as well as in all other work, it can be operated continuously without fatigue to the operator. Its weight is such that it can be easily carried about and handled by the workman. The 8-inch size weighs only 23 pounds.

One outstanding feature of this new air saw is its safeguard against accidents. The design combines the Ingersoll-Rand 3-cylinder type of air motor,

long in use in I-R grinders and light-weight drills, with the Crowe safety saw guard. This guard has been officially approved by the Ohio Industrial Commission, by the Pennsylvania Department of Labor and Industry, by the New Jersey Department of Labor, and by the Underwriters' Laboratories.

The safety guard is of a telescopic nature. It opens when the saw is applied to the material, and it automatically closes and locks in position as the cut is completed. It affords complete protection against accident or damage to the blade.

The saw guard has an adjustable stop so that the saw can be set for the required depth of the cut.

The 3-cylinder air motor is of the balanced type, smooth running, and free from breakdowns. All wearing parts, including the cylinders, are renewable. The cost of up-keep of this safety saw is almost negligible.

The saw is being manufactured in three sizes, known as B6, B8, and B12, and takes 6-inch, 8-inch, and 12-inch blades, respectively. It is a labor, time, and money saver in every field in which it is in use.

N. Y. Eng. Moves Offices

The New York Engineering Co. have recently moved their offices to the Evening Post Building, 75 West Street, which has just been completed. They formerly occupied No. 2 Rector Street, where they have been for the past 20 years.

Timken's Annual Report

The annual report of The Timken Roller Bearing Co. for the year ending December 31, 1926, shows net profits from sales, with other net income, of \$8,474,103, after ample reserve for depreciation and after reserve for United States income taxes. Cash dividends were paid during the year to the amount of \$5,403,969. A balance of \$3,045,120 was transferred to surplus account. Excerpts from Mr. H. H. Timken's report to stockholders are of interest to users of industrial machinery:

"Our sales of bearings to manufacturers of general industrial equipment were approximately double those of the previous year. Timken Bearings are now used extensively in some 300 different kinds of machinery, in many instances performing service heretofore thought impossible of any anti-friction bearing.

"During 1926 we completed our experimentation on three new types of Timken Bearings and began to successfully introduce them in the trade—a line of very large bearings for heavy duty in steel mills, rolling mills, sugar mills, cement mills, etc., the bearings ranging in size up to 35 inches in diameter; a line of "all thrust" bearings which are rapidly being adopted in special machinery such as valves, pivots, jacks, crane hooks, oil well swivels, etc., and a line of double bearings, self-contained, for certain types of electric motors, turbines, pumps, etc.

"We wish to make a brief statement about the use of Timken Bearings in railroad service. For about six years Timken Bearings have been successfully used in mine rail cars throughout the mining industry, over 40,000 mine cars being now equipped with Timken Bearings. The service is, of course, severe, but not comparable to railroad service, the loads carried ranging from 5 to 10 tons.

"The steam railroads have for some time been using gasoline rail cars for certain kinds of service, and to date the great majority of this type of railroad equipment is successfully equipped with Timken Bearings in the car journals as well as in other parts of the car. About 500 of these Timken-equipped cars have been in operation for several years on all the principal railroads in the United States. These cars operate at high speeds but do not weigh quite as much as the standard railway coaches.

"Our first large order for passenger car bearings was obtained in the fall of 1926 from the Chicago, Milwaukee and St. Paul Railroad for 63 new Pullman cars and 64 cars of Chicago, Milwaukee and St. Paul ownership, coaches, dining cars, baggage cars, etc., making 12 complete trains. This will be the first time in the history of an American railroad that complete transcontinental trains will be equipped with roller bearings."

DuPont Moves New York Office

The New York office of the explosives department of E. I. duPont de Nemours & Co., which company has been in existence for a century and a quarter, will move from its present quarters in the Equitable Building at 120 Broadway to the great new Graybar Building just east of the Grand Central Terminal toward the end of April, when its present lease expires. The Equitable and Graybar Buildings are the two biggest office buildings in the world. The general executive offices of this company are at Wilmington, Del.

The subsidiaries which this company controls through complete or majority stock ownership are the Associated Securities of Canada, Ltd., duPont Building Corporation, Rokeby Realty Co., E. I. duPont de Nemours & Co., of Pennsylvania, duPont Pathe Film Manufacturing Co., duPont Viscoid Co., Hotel duPont Co., duPont Securities Co., duPont National Ammonia Co., duPont Engineering Co., duPont Nitrate Co., duPont Rayon Co., duPont Cellophane Co., and the National Ammonia Co., Inc.

The principal companies in which it has an interest of 50 percent or less are the Eastern Alcohol Corporation, Nobel Chemical Finishes, Ltd., Canadian Explosives, Ltd., Compania Mexicana de Explosivos, Lazote, Inc., Compania Sud-America de Explosivos, Société Française Fabrikoid, A. S., and General Motors. Other miscellaneous securities are also held as investments.

The gigantic parent company is organized into a number of divisions. These are: Acids and heavy chemicals, ammonia, cellophane, chemical products, dyestuffs, explosives, fabrikoid, lithophone-dry colors and pigments—motion picture film, Pacific novelty division, paints and varnishes, pyralin and viscoloid, rayon and rubber products.

P. S. duPont is chairman of the Board of Directors of this organization, Irénée duPont, vice chairman of the Board of Directors and chairman of the Finance Committee, and Lamont duPont, president and chairman of the Executive Committee. There are 11,545 holders of the debenture stock of this company and 5,528 holders of its common stock.

New Distributors

Footo Bros. Gear & Machine Co. announce the following additions to their distributing organization.

The Interstate Machinery and Supply Co., 1006 Douglas St., Omaha, Nebr., have been appointed as representatives for IXL Products in Omaha, the eastern half of the State of Nebraska and the west portion of Iowa. Mr. W. L. Hutcheson, 201 E. California St., Oklahoma City, Okla., has been appointed for Oklahoma

City and the northern half of the State of Oklahoma. Nashville Machine & Supply Co., 123-135 Third Ave., North, Nashville, Tenn., have been appointed distributors for Nashville and the central part of the State of Tennessee. Hollis & Co., 305-11 E. Markham St., Little Rock, Ark., have been appointed distributors for the city of Little Rock and vicinity.

Armco Culvert Mfrs.' Association announces the opening of two new district offices.

A district office is opened at Lincoln, Nebr., with Mont C. Noble, formerly chief of Bureau of Roads and Bridges, Nebraska State Department of Public Works, as district engineer in charge. This office will be in charge of association work in Nebraska, Kansas, Iowa and Missouri.

A district office is opened also at East Point Georgia, with Tom M. Neibling, formerly research engineer, Gorge State Highway Department, as district engineer in charge. This office will be in charge of association work in Alabama, Florida, Georgia, Louisiana, Mississippi, Tennessee, North Carolina and South Carolina.

Coal Companies Group Insurance

Two large coal companies recently have acquired group life insurance for their employees. These policies were issued to them by the Prudential Insurance Co.

They are the Hudson Coal Co., at Radley, Kans., 61 lives for \$219,600, and the Pacific Coal Co., at Mercer, Ky., 202 lives for \$109,500. The policies are of the contributory type, the employees paying a part of the premiums and the companies assuming the remainder of the expense. Under the Hudson plan each worker is insured for \$3,600, while the Pacific policy provides coverage ranging from \$500 to \$2,500, according to the position held.

These are 2 of 24 similar group policies issued recently by the Prudential in various sections of the United States.

American Cyanamid Co. Moves Offices

According to a recent announcement, the American Cyanamid Co., of New York, will be located in the new Central Mercantile Bank Bldg., 535 Fifth Avenue at 44th Street. This removal also includes the offices of its associated companies, American Cyanamid Sales Co., Air Nitrates Corporation, Amalgamated Phosphate Co., Fumigators Supply Co., and Owl Fumigating Corporation.

Schonthal & Carroll, Inc., announce their appointment as district sales agents for The Coloder, and The Watt Car & Wheel Co., with headquarters at 224 South Michigan Avenue, Chicago, Illinois.

General Electric Employees' Securities

More than 25,000 employees of the General Electric Co. hold bonds in the General Electric Employees' Securities Corporation totaling over \$22,500,000, according to the fourth annual report of the organization. This is an average holding of \$903, an increase of \$143 over 1925 and an increase of 5 percent in the number of bondholders.

The investments owned by the corporation, from which its principal income is derived, include securities of approximately 100 public utility companies and stock of the General Electric and associated companies.

Cars and Engines for Pickands, Mather

Pickands, Mather & Co. has recently ordered from the Western Wheeled Scraper Co. 14 new type, side-hinged, air-dump cars. The cars are of 25 cubic yards capacity each and are intended for use at the Orwell iron mine, being opened by Pickands, Mather & Co. near Taconite, Minn., at the east end of the Mesabi range.

The company has also ordered for the same mine two 21 by 26 six-wheeled, switching engines from Lima Locomotive Works, Inc.

Sullivan Machinery Personnel

O. J. Neslage, of the St. Louis office sales staff, Sullivan Machinery Co., for several years past located in the Joplin, Mo., lead and zinc district, has been appointed local manager at Mexico City, Edificio Oliver No. 3. Mr. A. W. Oakes, for several years past manager at Mexico City, has been assigned to a post in the United States. Mr. C. W. Miller has been appointed special representative of the Sullivan Machinery Co., in Cuba, and will cooperate with the company's general agents for Cuba, Messrs. The Purdy and Henderson Trading Co., Habana 55, asquina a Empedrado, Havana, Cuba. Matt Brodie, manager for Asia, of the Sullivan Machinery Co., sailed last week from San Francisco for Tokyo, following a three months furlough in this country.

American Manganese Steel Personnel Changes

Mr. E. S. Black has rejoined the American Manganese Steel Co., with his headquarters at Chicago Heights, Illinois. His duties are those of consulting engineer, both mechanical and sales. Mr. Black's long and extensive experience in the steel industry generally and his intimate contact with the manganese steel castings business in all its phases, over many years, peculiarly fit him for serving intelligently the users of manganese steel castings.

Mr. A. H. Exton has also rejoined the Amsco organization, in the capacity of chief engineer. Mr. Exton is an out-

standing authority in the design and manufacture of manganese steel castings.

The Mine Safety Appliances Co., Pittsburgh, Pa., announces the promotion of Edward H. Kellogg from assistant general sales manager to general sales manager.

During the World War Mr. Kellogg served in the Research Division of the Chemical Warfare Service and at present holds a commission as major in the Chemical Warfare Reserve Corps, United States Army. Mr. Kellogg attended George Washington University and is a graduate of Kansas State Agricultural College.

Other changes in the M. S. A. organization include the appointment of C. W. Nelson as Kentucky representative with headquarters at 4505 West Eighth Street, Cincinnati, and Ray H. Magee as southern West Virginia representative, with headquarters at Mount Hope, W. Va. Mr. Nelson was formerly safety engineer for the Hillman Coal & Coke Co. and Mr. Magee previously was technical representative with the Grasselli Powder Co. in West Virginia.

Other appointments include those of Beach M. Chenoweth and Thomas Brown as representatives for Tennessee and Alabama, with headquarters at 650 Brown Marx Building, Birmingham, Ala.

Urquhart Now with Philadelphia Grease Co.

Mr. M. B. Urquhart, who has been northwestern manager for the Keystone Lubricating Co., of Philadelphia, Pa., for the past 20 years has resigned his position with this concern, and on January 1 assumed the western management of the Philadelphia Grease Manufacturing Co., of Philadelphia, Pa., manufacturers of the well-known Philadelphia Grease, with offices and warehouses located in the Ideal Building, Denver, Colo., and 144 South Fifth West Street, Salt Lake City, Utah.

O-B Bulletin

Bulletin No. 219, issued by the Ohio Brass Co., Mansfield, Ohio, describes Crouse-Hinds Imperial Incandescent Headlights for Mine Locomotives.

American Brown Boveri Electric Corporation, 165 Broadway, New York City, announces the publication of bulletin No. 900 on Hydraulic Dredges and bulletin No. 901 on Floating Pipe Lines for Hydraulic Dredges.

Bulletin No. 900 treats with hydraulic dredge types, their fields of application, hydraulic dredge equipment, factors upon which dredge-earning power depend, and presents a list of questions designed to cover the data necessary for specified hydraulic dredge equipment.

Bulletin No. 901 treats particularly with an improved ball joint for hydraulic dredge pipe lines.

G. E. New Catalogs

Among the new pamphlets and catalogs recently published by the General Electric Co., are the following: G-E Medium Speed Synchronous Motors; G-E Automatic Control Panels for Industrial Electric Heating; and Automatic Switching Equipment.

Wolmanized Lumber

A bulletin issued by the American Lumber & Treating Corporation, 1138 Lake Shore Drive, Chicago, gives some very interesting information concerning Wolmanized Lumber. The pamphlet is illustrated, and gives full information concerning what may be expected through the treating of lumber by the Wolman process. Copies are obtainable from the Chicago office.

Traylor Engineering Catalog

Traylor Engineering & Mfg. Co., Allentown, Pa., has issued a new bulletin, No. 1096, which describes their Dodge Type Jaw Crusher.

United Filters Issues New Catalog

United Filters Corporation, Hazleton, Pa., has issued bulletin No. 130, on the American Continuous Filter. It contains thirty-six pages of valuable information, and is well illustrated with halftones and diagrams. Copies may be obtained upon request from the Hazleton office.

Bethlehem Equipment

Bethlehem Steel Corporation, Bethlehem, Pa., has issued another booklet on Mine and Industrial Track Equipment, known as Catalog K.

This catalog describes briefly a comprehensive list of products such as frogs, switches, switch stands, crossings, steel ties, light rails, mine cars, and other Bethlehem products.

A special article, "Better Service from Mine Track," given on pages 6 to 17, inclusive, will be of value to every one interested in mine production.

Traylor Engineering Bulletin

Traylor Engineering & Mfg. Co., Allentown, Pa., has released their new bulletin No. 2097, describing their Blake Type Jaw Crusher, which contains thirty-four pages of data, statistics, tables, and information in detail concerning this equipment. Copies of the bulletin may be obtained through request to the Allentown office.

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ACETYLENE GENERATING APPARATUS

Oxweld Acetylene Co., 30 E. 42d St.,
New York City.

ACID, SULPHURIC

Irvington Smelting & Refining
Works, Irvington, N. J.

AERIAL TRAMWAYS

American Steel & Wire Co., Chicago
and New York.

A. Leachen & Sons Rope Co.,
St. Louis, Mo.

AFTERCOOLERS (Air)

Ingersoll-Rand Co., New York City.

AIR COMPRESSORS

Allis-Chalmers Mfg. Co., Milwaukee,
Wis.

Sullivan Machinery Co., 122 S.
Mich. Ave., Chicago, Ill.

Ingersoll-Rand Co., 11 Broadway,
New York City.

AIR HOSE COUPLINGS

Knox Mfg. Co., 811-821 Cherry St.,
Philadelphia, Pa.

ANNUNCIATOR WIRES & CABLES

John A. Roebling's Sons Co.,
Trenton, New Jersey.

ANNUNCIATOR WIRES & CABLES, INSULATED

American Steel & Wire Co., Chicago,
Ill., and New York.

ARMATURE COILS & LEADS

John A. Roebling's Sons Co.,
Trenton, New Jersey.

AUTOMATIC CAR CAGES

Connellsville Mfg. & Mine Supply
Co., Connellsville, Pa.

Roberts & Schaefer Co., Chicago, Ill.

AUTOMATIC CAR DUMPERS

Roberts & Schaefer Co., Chicago, Ill.

AUTOMATIC (Mine Doors, Truck and Electric Switches)

American Mine Door Co., Canton,
Ohio.

AUTOMATIC SWITCH THROWERS

American Mine Door Co., Canton,
Ohio.

AUTOMOBILE CABLES

John A. Roebling's Sons Co.,
Trenton, New Jersey.

BALLAST UNLOADER ROPES

John A. Roebling's Sons Co.,
Trenton, New Jersey.

BATTERIES, DRY (for Bells, Buzzers, Signals, Blasting)

National Carbon Co., Inc., 30 East
42nd St., New York City.

BATTERIES (Storage, Gas Welding, Cutting, Dissolved Acetylene)

Frest-O-Lite Co., 30 East 42d St.,
New York City.

BELL CORD

John A. Roebling's Sons Co.,
Trenton, New Jersey.

BELTING (Conveyor, Elevator, Transmission)

The Jeffrey Mfg. Company, 958-99
North 4th St., Columbus, Ohio.
Link-Belt Co., 300 W. Pershing Rd.,
Chicago, Ill.

BELTING, SILENT CHAIN

Link-Belt Co., 300 W. Pershing Rd.,
Chicago, Ill.

Morse Chain Co., Ithaca, N. Y.

BINS (Coke and Coal)

The Jeffrey Mfg. Company, 958-99
North 4th St., Columbus, Ohio.

Link-Belt Co., 300 W. Pershing Rd.,
Chicago, Ill.

BITS Carbon (Diamonds) for Core Drill

R. S. Patrick, Sellwood Building,
Duluth, Minn.

BITS, Diamond Drilling

R. S. Patrick, Sellwood Building,
Duluth, Minn.

BIT SHARPENERS

Sullivan Machinery Co., 122 S.
Mich. Ave., Chicago, Ill.

Ingersoll-Rand Co., 11 Broadway,
New York City.

BLACK DIAMONDS

R. S. Patrick, Sellwood Building,
Duluth, Minn.

BLASTING POWDER

Atlas Powder Co., Wilmington, Del.

E. I. du Pont de Nemours & Co.,
Inc., Wilmington, Del.

Hercules Powder Co., 934 King St.,
Wilmington, Del.

BLASTING SUPPLIES

Atlas Powder Co., Wilmington, Del.

E. I. du Pont de Nemours & Co.,
Inc., Wilmington, Del.

Hercules Powder Co., 934 King St.,
Wilmington, Del.

BLASTING UNITS (Dry Battery)

National Carbon Co., Inc., 30 East
42nd St., New York City.

BLOWERS, CENTRIFUGAL

Ingersoll-Rand Co., 11 Broadway,
New York City.

The Jeffrey Mfg. Company, 958-99
North 4th St., Columbus, Ohio.

Robinson Ventilating Co.,
Zelenople, Pa.

BLOWERS (Tubing)

Robinson Ventilating Co.,
Zelenople, Pa.

BLOWERS (Turbine)

Robinson Ventilating Co.,
Zelenople, Pa.

BLOWPIPES, Brazing, Carbon Burning, Cutting, Lead Burning, Welding, Welding and Cutting

Oxweld Acetylene Co., 30 E. 42d
St., New York City.

BLUE CENTER STEEL

WIRE ROPE

John A. Roebling's Sons Co.,
Trenton, New Jersey.

BOND TERMINALS

Amer. Mine Door Co., Canton, Ohio.

BORTZ

R. S. Patrick, Sellwood Building,
Duluth, Minn.

BREAKER MACHINERY

American Rheolaveur Corporation,
Wilkes-Barre, Pa.

Vulcan Iron Works, Wilkes-Barre,
Pa.

BREAKERS (Construction and Machinery)

The Jeffrey Mfg. Company, 958-99
North 4th St., Columbus, Ohio.

BREAST MACHINES

Goodman Mfg. Co., Halsted St. and
48th Place, Chicago, Ill.

BRIQUETTING MACHINERY

Vulcan Iron Works, Wilkes-Barre,
Pa.

BRUSHES (Carbon, Graphite and Metal Graphite for Electric Motors, Generators and Converters)

National Carbon Co., Inc., Cleveland,
Ohio and San Francisco, Calif.

BUCKETS (Elevator)

Hendrick Mfg. Co., Carbondale, Pa.

The Jeffrey Mfg. Company, 958-99
North 4th St., Columbus, Ohio.

Link-Belt Co., 300 W. Pershing Rd.,
Chicago, Ill.

CABLE GREASE

Keystone Lubricating Co., Philadelphia,
Pa.

CABLES

American Steel & Wire Co., Chicago
and New York.

A. Leachen & Sons Rope Co.,
St. Louis, Mo.

CABLES (Connectors and Guides)

American Mine Door Co., Canton,
Ohio.

Leachen & Sons Rope Co., A., St.
Louis, Mo.

CABLES, INSULATED

John A. Roebling's Sons Co.,
Trenton, New Jersey.

CABLES, SUSPENSION

BRIDGE

John A. Roebling's Sons Co.,
Trenton, New Jersey.

CABLEWAYS

American Steel & Wire Co., Chicago,
Ill., and New York.

S. Flory Mfg. Co., Bangor, Pa.

The Jeffrey Mfg. Company, 958-99
North 4th St., Columbus, Ohio.

CAGE DUMPERS, ROTARY

Roberts & Schaefer Co., Chicago, Ill.

CAGE (Safety Appliances)

Connellsville Mfg. & Mine Supply
Co., Connellsville, Pa.

CAGE STOPS & LOCKS

Mining Safety Device Co., Bowers-
ton, Ohio.

Roberts & Schaefer Co., Chicago, Ill.

CAGERS, AUTOMATIC

Mining Safety Device Co., Bowers-
ton, Ohio.

CAGERS, AUTOMATIC & MANUAL

Roberts & Schaefer Co., Chicago, Ill.

CAGES

Allis-Chalmers Mfg. Co., Milwaukee,
Wis.

Connellsville Mfg. & Mine Supply
Co., Connellsville, Pa.

Vulcan Iron Works, Wilkes-Barre,
Pa.

CAGES (Self-dumping)

Roberts & Schaefer Co., Chicago, Ill.

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Pa.

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de Sales Division, 30 East
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Roberts & Schaefer Co., Chicago, Ill.

CAR DUMPERS (Rotary)

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Chicago, Ill.

Roberts & Schaefer Co., Chicago, Ill.

CAR FEEDERS

Roberts & Schaefer Co., Chicago, Ill.

CAR HAULS

Goodman Mfg. Co., Halsted St. and
48th Place, Chicago, Ill.

The Jeffrey Mfg. Company, 958-99
North 4th St., Columbus, Ohio.

Link-Belt Co., 300 W. Pershing Rd.,
Chicago, Ill.

Roberts & Schaefer Co., Chicago, Ill.

CAR PULLERS

S. Flory Mfg. Co., Bangor, Pa.

CAR RETARDERS

Roberts & Schaefer Co., Chicago, Ill.

CAR STOPS, AUTOMATIC & MANUAL

Roberts & Schaefer Co., Chicago, Ill.

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American Steel & Wire Co., Chicago,
Ill., and New York.

John A. Roebling's Sons Co.,
Trenton, New Jersey.

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Goodman Mfg. Co., Halsted St. and
48th Place, Chicago, Ill.

The Jeffrey Mfg. Company, 958-99
North 4th St., Columbus, Ohio.

Link-Belt Co., 300 W. Pershing Rd.,
Chicago, Ill.

CASTINGS, GRAY IRON

Link-Belt Co., 300 W. Pershing Rd.,
Chicago, Ill.

Vulcan Iron Works, Wilkes-Barre,
Pa.

CASTINGS, OPEN HEARTH STEEL

Vulcan Iron Works, Wilkes-Barre,
Pa.

CHAINS

Goodman Mfg. Co., Halsted St. and
48th Place, Chicago, Ill.

The Jeffrey Mfg. Company, 958-99
North 4th St., Columbus, Ohio.

Link-Belt Co., 300 W. Pershing Rd.,
Chicago, Ill.

Morse Chain Co., Ithaca, N. Y.

CHAINS, AUTOMOBILE ENGINE

Link-Belt Co., 300 W. Pershing Rd.,
Chicago, Ill.

Morse Chain Co., Ithaca, N. Y.

CHAINS, COAL CUTTING

Goodman Mfg. Co., Halsted St. and
48th Pl., Chicago, Ill.

The Jeffrey Mfg. Company, 958-99
North 4th St., Columbus, Ohio.

Link-Belt Co., 300 W. Pershing Rd.,
Chicago, Ill.

CHAINS, DRIVE

Goodman Mfg. Co., Halsted St. and
48th Place, Chicago, Ill.

The Jeffrey Mfg. Company, 958-99
North 4th St., Columbus, Ohio.

Link-Belt Co., 300 W. Pershing Rd.,
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Morse Chain Co., Ithaca, N. Y.

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The Jeffrey Mfg. Company, 958-99 North 4th St., Columbus, Ohio.

Link-Belt Co., 300 W. Pershing Rd., Chicago, Ill.

COAL CLEANING MACHINERY

American Rheolaveur Corporation, Wilkes-Barre, Pa.

Link-Belt Co., 300 W. Pershing Road, Chicago, Ill.

Roberts & Schaefer Co., Chicago, Ill.

COAL COMPANIES

General Coal Company, Land Title Bldg., Philadelphia, Pa.

Lehigh Coal & Navigation Co., Philadelphia, Pa.

Thorne, Neale & Co., Philadelphia, Pa.

COAL CRUSHERS

Connellville Mfg. & Mine Supply Co., Connellville, Pa.

The Jeffrey Mfg. Company, 958-99 North 4th St., Columbus, Ohio.

Link-Belt Co., 300 W. Pershing Rd., Chicago, Ill.

COAL CRUSHERS & ROLLS

Link-Belt Co., 300 W. Pershing Rd., Chicago, Ill.

Vulcan Iron Works, Wilkes-Barre, Pa.

COAL CUTTERS

Goodman Mfg. Co., Halsted St. and 48th Pl., Chicago, Ill.

Howells Mining Drill Co., Plymouth, Pa.

Ingersoll-Rand Co., 11 Broadway, New York City.

The Jeffrey Mfg. Company, 958-99 North 4th St., Columbus, Ohio.

Sullivan Machinery Co., 122 S. Mich. Ave., Chicago, Ill.

COAL HANDLING MACHINERY

Conveyor Sales Co., Inc., 299 Broadway, New York City.

Goodman Mfg. Co., Halsted St. and 48th Pl., Chicago, Ill.

The Jeffrey Mfg. Company, 958-99 North 4th St., Columbus, Ohio.

Link-Belt Co., 300 W. Pershing Rd., Chicago, Ill.

Roberts & Schaefer Co., Chicago, Ill.

COAL LOADERS

Goodman Mfg. Co., Halsted St. and 48th Pl., Chicago, Ill.

The Jeffrey Mfg. Company, 958-99 North 4th St., Columbus, Ohio.

Link-Belt Co., 300 W. Pershing Rd., Chicago, Ill.

COAL MINING MACHINERY

Goodman Mfg. Co., Halsted St. and 48th Pl., Chicago, Ill.

Howells Mining Drill Co., Plymouth, Pa.

Ingersoll-Rand Co., 11 Broadway, New York City.

The Jeffrey Mfg. Company, 958-99 North 4th St., Columbus, Ohio.

Link-Belt Co., 300 W. Pershing Rd., Chicago, Ill.

Sullivan Machinery Co., 122 S. Mich. Ave., Chicago, Ill.

COAL MINING PLANTS

Goodman Mfg. Co., Halsted St. and 48th Pl., Chicago, Ill.

Ingersoll-Rand Co., 11 Broadway, New York City.

The Jeffrey Mfg. Company, 958-99 North 4th St., Columbus, Ohio.

Link-Belt Co., 300 W. Pershing Rd., Chicago, Ill.

Roberts & Schaefer Co., Wrigley Bldg., Chicago, Ill.

COAL SEPARATORS

(Pneumatic)

Roberts & Schaefer Co., Chicago, Ill.

COMPRESSORS, AIR

Allis-Chalmers Mfg. Co., Milwaukee, Wis.

Ingersoll-Rand Co., 11 Broadway, New York City.

COMPRESSORS, MINE CAR

Ingersoll-Rand Co., 11 Broadway, New York City.

CONCENTRATORS (Table)

Allis-Chalmers Mfg. Co., Milwaukee, Wis.

CONCRETE REINFORCEMENT

American Steel & Wire Co., Chicago, and New York.

CONDENSERS

Allis-Chalmers Mfg. Co., Milwaukee, Wis.

Ingersoll-Rand Co., 11 Broadway, New York City.

CONTROLLERS

Goodman Mfg. Co., Halsted St. and 48th Pl., Chicago, Ill.

CONVERTORS, COPPER

Allis-Chalmers Mfg. Co., Milwaukee, Wis.

CONVEYORS

Conveyor Sales Co., Inc., 299 Broadway, New York City.

The Jeffrey Mfg. Company, 958-99 North 4th St., Columbus, Ohio.

Link-Belt Co., 300 W. Pershing Rd., Chicago, Ill.

Roberts & Schaefer Co., Chicago, Ill.

CONVEYOR BEARINGS

Link-Belt Co., 300 W. Pershing Road, Chicago, Ill.

CONVEYORS, BELT

The Jeffrey Mfg. Company, 958-99 North 4th St., Columbus, Ohio.

Link-Belt Co., 300 W. Pershing Rd., Chicago, Ill.

CONVEYORS, CHAIN FLIGHT

The Jeffrey Mfg. Company, 958-99 North 4th St., Columbus, Ohio.

Link-Belt Co., 300 W. Pershing Rd., Chicago, Ill.

CONVEYORS, COAL

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Link-Belt Co., 300 W. Pershing Rd., Chicago, Ill.

CONVEYORS AND ELEVATORS

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Conveyor Sales Co., Inc., 299 Broadway, New York City.

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Link-Belt Co., 300 W. Pershing Rd., Chicago, Ill.

CONVEYORS, PAN OR APRON

Conveyor Sales Co., Inc., 299 Broadway, New York City.

The Jeffrey Mfg. Company, 958-99 North 4th St., Columbus, Ohio.

Link-Belt Co., 300 W. Pershing Rd., Chicago, Ill.

CONVEYORS, SCREW

The Jeffrey Mfg. Company, 958-99 North 4th St., Columbus, Ohio.

Link-Belt Co., 300 W. Pershing Rd., Chicago, Ill.

COOLERS, Man

Robinson Ventilating Co., Zelenople, Pa.

COOLERS, ROTARY

Vulcan Iron Works, Wilkes-Barre, Pa.

COPPER WIRE & STRAND (Bare)

American Steel & Wire Co., Chicago, Ill., and New York.

John A. Roebbing's Sons Co., Trenton, New Jersey

CORE DRILLS, Carbon (Diamonds) for

R. S. Patrick, Sellwood Building, Duluth, Minn.

CORE DRILLING

H. R. Ameling Prospecting Co., Rolla, Mo.

Hoffman Bros., Panxutawney, Pa.

Mott Core Drilling Co., Huntington, W. Va.

COUPLINGS, FLEXIBLE

Fawcett Machine Co., Pittsburgh, Pa.

COUPLINGS, ROCK DRILL

Knox Mfg. Co., Philadelphia, Pa.

CROSSINGS AND CROSSOVERS

Central Frog & Switch Co., Cincinnati, Ohio.

CROSSOVERS

Sweet's Steel Co., Williamsport, Pa.

CRUSHERS

The Jeffrey Mfg. Company, 958-99 North 4th St., Columbus, Ohio.

Allis-Chalmers Mfg. Co., Milwaukee, Wis.

CRUSHERS, COAL

Connellville Mfg. & Mine Supply Co., Connellville, Pa.

The Jeffrey Mfg. Company, 958-99 North 4th St., Columbus, Ohio.

Link-Belt Co., 300 W. Pershing Rd., Chicago, Ill.

CRUSHERS, SINGLE & DOUBLE ROLL

The Jeffrey Mfg. Company, 958-99 North 4th St., Columbus, Ohio.

Link-Belt Co., 300 W. Pershing Rd., Chicago, Ill.

CRUSHING PLANTS, COKE

The Jeffrey Mfg. Company, 958-99 North 4th St., Columbus, Ohio.

Link-Belt Co., 300 W. Pershing Rd., Chicago, Ill.

CUP GREASE

Keystone Lubricating Co., Philadelphia, Pa.

CUTTING APPARATUS, Oxy - Acetylene, Oxy - Hydrogen

Oxwell Acetylene Co., 30 E. 42d St., New York City.

DECARBONIZING APPARATUS

Oxwell Acetylene Co., 30 E. 42d St., New York City.

DESIGNERS OF PLANTS

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Link-Belt Co., 300 W. Pershing Rd., Chicago, Ill.

Roberts & Schaefer Co., Chicago, Ill.

DIAMOND CORE DRILL CONTRACTING

H. R. Ameling Prospecting Co., Rolla, Mo.

Hoffman Bros., Panxutawney, Pa.

Mott Core Drilling Co., Huntington, W. Va.

DIAMOND DRILLING

CARBON

R. S. Patrick, Sellwood Building, Duluth, Minn.

DIAMONDS, BLACK (See Carbon and Bortz)

R. S. Patrick, Sellwood Building, Duluth, Minn.

DIAMONDS, INDUSTRIAL

R. S. Patrick, Sellwood Building, Duluth, Minn.

DIGGERS & PICKS, Pneumatic

Ingersoll-Rand Co., New York City.

DITCHING MACHINES

Keystone Churn Drill Co., Beaver Falls, Pa.

DOORS, AUTOMATIC MINE

American Mine Door Co., Canton, Ohio.

DOWNIE DEEP WELL PUMPS

Keystone Churn Drill Co., Beaver Falls, Pa.

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Ingersoll-Rand Co., 11 Broadway, New York City.

DRILLING, DIAMONDS FOR

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Ingersoll-Rand Co., 11 Broadway, New York City.

DRILLS (Blast Hole)

Howells Mining Drill Co., Plymouth, Pa.

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Keystone Churn Drill Co., Beaver Falls, Pa.

DRILL BITS, Carbon (Diamonds) for

R. S. Patrick, Sellwood Building, Duluth, Minn.

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DRILL COLUMNS & MOUNTINGS

Ingersoll-Rand Co., New York City.

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R. S. Patrick, Sellwood Building, Duluth, Minn.

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Hoffman Bros., Panxutawney, Pa.

Ingersoll-Rand Co., 11 Broadway, New York City.

Keystone Churn Drill Co., Beaver Falls, Pa.

Mott Core Drilling Co., Huntington, W. Va.

DRILLS, DIAMOND GASOLINE OUTFITS

Mott Core Drilling Co., Huntington, W. Va.

DRILLS, ELECTRIC

General Electric Co., Schenectady, N. Y.

Howells Mining Drill Co., Plymouth, Pa.

Ingersoll-Rand Co., 11 Broadway, New York City.

The Jeffrey Mfg. Company, 958-99 North 4th St., Columbus, Ohio.

DRILLS, HAMMER

Ingersoll-Rand Co., 11 Broadway, New York City.

Sullivan Machinery Co., 122 S. Mich. Ave., Chicago, Ill.

DRILLS (Hand Operated Coal)

Howells Mining Drill Co., Plymouth, Pa.

Ohio Brass Co., Mansfield, Ohio.

DRILLS, MINERAL PROSPECTING

Keystone Churn Drill Co., Beaver Falls, Pa.

Mott Core Drilling Co., Huntington, W. Va.

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Howells Mining Drill Co., Plymouth, Pa.

Ingersoll-Rand Co., 11 Broadway, New York City.

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Ingersoll-Rand Co., 11 Broadway, New York City.

Sullivan Machinery Co., 122 S. Mich. Ave., Chicago, Ill.

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Link-Belt Co., 300 W. Pershing Rd., Chicago, Ill.

Morse Chain Co., Ithaca, N. Y.

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Connellsville Mfg. & Mine Supply Co., Connellsville, Pa.

Link-Belt Co., 300 W. Pershing Rd., Chicago, Ill.

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Vulcan Iron Works, Wilkes-Barre, Pa.

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Roberts & Schaefer Co., Chicago, Ill.

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Hercules Powder Co., 934 King St., Wilmington, Del.

DYNAMOS

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Goodman Mfg. Co., Forty-eighth Place and Halsted St., Chicago, Ill.

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General Electric Co., Schenectady, N. Y.

ELECTRICAL CABLES & WIRES

American Steel & Wire Co., Chicago, Ill., and New York.

ELECTRIC DRILLS

Howells Mining Drill Co., Plymouth, Pa.

ELECTRIC HOISTING MACHINERY

Allis-Chalmers Mfg. Co., Milwaukee, Wis.

ELECTRIC LOCOMOTIVES

General Electric Co., Schenectady, N. Y.

Goodman Mfg. Co., Forty-eighth Place and Halsted St., Chicago, Ill.

The Jeffrey Mfg. Company, 958-99 North 4th St., Columbus, Ohio.

ELECTRIC LOCOMOTIVE CABLES

John A. Roebling's Sons Co., Trenton, New Jersey.

ELECTRIC MINE SUPPLIES

General Electric Co., Schenectady, N. Y.

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American Steel & Wire Co., Chicago and New York.

ELECTRICAL SUPPLIES

General Electric Co., Schenectady, N. Y.

ELECTRICAL WIRES & CABLES

John A. Roebling's Sons Co., Trenton, New Jersey.

ELECTRODES, WELDING

John A. Roebling's Sons Co., Trenton, New Jersey.

ELEVATORS

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Link-Belt Co., 300 W. Pershing Rd., Chicago, Ill.

ELEVATORS, BUCKET

The Jeffrey Mfg. Company, 958-99 North 4th St., Columbus, Ohio.

Link-Belt Co., 300 W. Pershing Rd., Chicago, Ill.

ELEVATOR CABLES & ROPES

John A. Roebling's Sons Co., Trenton, New Jersey.

ELEVATOR MACHINERY

The Jeffrey Mfg. Company, 958-99 North 4th St., Columbus, Ohio.

Link-Belt Co., 300 W. Pershing Rd., Chicago, Ill.

ENGINES, GAS AND GAS-OIL

Allis-Chalmers Mfg. Co., Milwaukee, Wis.

Ingersoll-Rand Co., 11 Broadway, New York City.

ENGINES (Hoisting and Hauling)

Connellsville Mfg. & Mine Supply Co., Connellsville, Pa.

ENGINES, OIL

Allis-Chalmers Mfg. Co., Milwaukee, Wis.

Ingersoll-Rand Co., 11 Broadway, New York City.

ENGINES, Rope Haulage

S. Flory Mfg. Co., Bangor, Pa.

ENGINES, STEAM

Allis-Chalmers Mfg. Co., Milwaukee, Wis.

Ingersoll-Rand Co., 11 Broadway, New York City.

ENGINES, Winding

S. Flory Mfg. Co., Bangor, Pa.

ENGINEERS

H. R. Ameling Prospecting Co., Rolla, Mo.

EXCAVATORS

Keystone Churn Drill Co., Beaver Falls, Pa.

EXPLOSIVES

Atlas Powder Co., Wilmington, Del.

du Pont Powder Co., The E. I., Wilmington, Del.

Hercules Powder Co., 934 King St., Wilmington, Del.

FAN DRIVES

Fawcuss Machine Co., Pittsburgh, Pa.

Link-Belt Co., 300 W. Pershing Rd., Chicago, Ill.

FANS, Man Cooling

Robinson Ventilating Co., Zellenople, Pa.

FANS, Turbine

Robinson Ventilating Co., Zellenople, Pa.

FANS, VENTILATING

Connellsville Mfg. & Mine Supply Co., Connellsville, Pa.

The Jeffrey Mfg. Company, 958-99 North 4th St., Columbus, Ohio.

Robinson Ventilating Co., Zellenople, Pa.

Vulcan Iron Works, Wilkes-Barre, Pa.

FEEDERS (Crossover, Kick-back, Rotary and Dump)

Link-Belt Co., 300 W. Pershing Rd., Chicago, Ill.

Mining Safety Device Co., Bowers-ton, Ohio.

Roberts & Schaefer Co., Chicago, Ill.

FEEDERS (Hand Operated)

Mining Safety Device Co., Bowers-ton, Ohio.

Roberts & Schaefer Co., Chicago, Ill.

FEEDERS, ORE

The Jeffrey Mfg. Company, 958-99 North 4th St., Columbus, Ohio.

Link-Belt Co., 300 W. Pershing Rd., Chicago, Ill.

FEEDERS (Semi-automatic)

Mining Safety Device Co., Bowers-ton, Ohio.

FENCE POSTS

Sweet's Steel Co., Williamsport, Pa.

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FLASHLIGHTS AND BATTERIES (Mine Safety)

National Carbon Co., Inc., 30 East 42nd St., New York City.

FLOORING, STEEL

Hendrick Mfg. Co., Carbondale, Pa.

FLOTATION MACHINES

Allis-Chalmers Mfg. Co., Milwaukee, Wis.

FLOTATION OILS

Hercules Powder Co., 934 King St., Wilmington, Del.

FLOW METERS

General Electric Co., Schenectady, N. Y.

FLUX, WELDING

Oxweld Acetylene Co., 30 E. 42nd St., New York City.

FORGINGS

Allis-Chalmers Mfg. Co., Milwaukee, Wis.

FROGS

Sweet's Steel Co., Williamsport, Pa.

FROGS AND SWITCHES

Amer. Mine Door Co., Canton, Ohio.

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GAS (Nitrogen, Oxygen)

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GEARS

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Link-Belt Co., 300 W. Pershing Rd., Chicago, Ill.

GEARS, BEVEL

Fawcuss Machine Co., Pittsburgh, Pa.

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The Jeffrey Mfg. Company, 958-99 North 4th St., Columbus, Ohio.

Link-Belt Co., 300 W. Pershing Rd., Chicago, Ill.

GEARS, HERRINGBONE

Fawcuss Machine Co., Pittsburgh, Pa.

Link-Belt Co., 300 W. Pershing Rd., Chicago, Ill.

GEARS, Machine Cut

Link-Belt Co., 300 W. Pershing Rd., Chicago, Ill.

Vulcan Iron Works, Wilkes-Barre, Pa.

GEARS, Moulded Tooth

Link-Belt Co., 300 W. Pershing Rd., Chicago, Ill.

Vulcan Iron Works, Wilkes-Barre, Pa.

GEARS, SILENT CHAIN

Link-Belt Co., 300 W. Pershing Rd., Chicago, Ill.

Morse Chain Co., Ithaca, N. Y.

GEARS, SPUR

Fawcuss Machine Co., Pittsburgh, Pa.

Goodman Mfg. Co., Halsted St. and 48th Place, Chicago, Ill.

The Jeffrey Mfg. Company, 958-99 North 4th St., Columbus, Ohio.

Link-Belt Co., 300 W. Pershing Rd., Chicago, Ill.

GEARS, WORM

Fawcuss Machine Co., Pittsburgh, Pa.

The Jeffrey Mfg. Company, 958-99 North 4th St., Columbus, Ohio.

GEARS, WORM WHEELS

Fawcuss Machine Co., Pittsburgh, Pa.

GENERATORS AND GENERATING SETS

Allis-Chalmers Mfg. Co., Milwaukee, Wis.

Goodman Mfg. Co., Halsted St. and 48th Pl., Chicago, Ill.

GENERATORS, ACETYLENE

Oxweld Acetylene Co., 30 E. 42nd St., New York City.

GLOVES, ASBESTOS

Oxweld Acetylene Co., 30 E. 42nd St., New York City.

GOOGLES, WELDING

Oxweld Acetylene Co., 30 E. 42nd St., New York City.

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Hendrick Mfg. Co., Carbondale, Pa.

GREASE

Keystone Lubricating Co., Philadelphia, Pa.

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John A. Roebling's Sons Co., Trenton, New Jersey.

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John A. Roebling's Sons Co., Trenton, New Jersey.

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The Jeffrey Mfg. Company, 958-99 North 4th St., Columbus, Ohio.

Ohio Brass Co., Mansfield, Ohio.

HEATER CORD

John A. Roebling's Sons Co., Trenton, New Jersey.

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Fawcuss Machine Co., Pittsburgh, Pa.

Link-Belt Co., 300 W. Pershing Rd., Chicago, Ill.

HOIST DRIVES

Link-Belt Co., 300 W. Pershing Rd., Chicago, Ill.

HOISTING ROPES

American Steel & Wire Co., Chicago, Ill., and New York.

Connellsville Mfg. & Mine Supply Co., Connellsville, Pa.

A. Leschen & Sons Rope Co., St. Louis, Mo.

John A. Roebling's Sons Co., Trenton, New Jersey.

HOISTS

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Ingersoll-Rand Co., 11 Broadway, New York City.

Link-Belt Co., 300 W. Pershing Rd., Chicago, Ill.

Sullivan Machinery Co., 122 S. Mich. Ave., Chicago, Ill.

HOISTS, AIR

Ingersoll-Rand Co., 11 Broadway, New York City.

Sullivan Machinery Co., 122 S. Mich. Ave., Chicago, Ill.

HOISTS, ELECTRIC

Allis-Chalmers Mfg. Co., Milwaukee, Wis.

Connellsville Mfg. & Mine Supply Co., Connellsville, Pa.

Diamond Machine Co., Monongahela, Pa.

Goodman Mfg. Co., Halsted St. and 48th Place, Chicago, Ill.

Link-Belt Co., 300 W. Pershing Rd., Chicago, Ill.

Sullivan Machinery Co., 122 S. Mich. Ave., Chicago, Ill.

Vulcan Iron Works, Wilkes-Barre, Pa.

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Sullivan Machinery Co., 122 S. Mich. Ave., Chicago, Ill.

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S. Flory Mfg. Co., Bangor, Pa.

HOISTS, GASOLINE

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HOISTS, Room

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HOISTS, Room and Gathering

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Goodman Mfg. Co., Halsted St. and 48th Place, Chicago, Ill.

HOISTS, Scraper-Loader

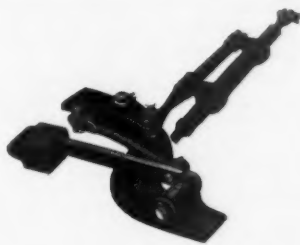
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HOISTS, Shaft, Electric

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HOISTS, Shaft, Steam

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HOISTS, Slope, Electric
S. Flory Mfg. Co., Bangor, Pa.

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S. Flory Mfg. Co., Bangor, Pa.

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Knox Mfg. Co., 811-821 Cherry St., Philadelphia, Pa.

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INCINERATORS
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Ohio Brass Co., Mansfield, Ohio.

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INSULATORS (Trolley)
General Electric Co., Schenectady, N. Y.

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Vulcan Iron Works, Wilkes-Barre, Pa.

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LIGHT STEEL RAILS (A. S. C. E. Sections)
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Link-Belt Co., 300 W. Pershing Rd., Chicago, Ill.

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The Jeffrey Mfg. Company, 958-99 North 4th St., Columbus, Ohio.
Link-Belt Co., 300 W. Pershing Rd., Chicago, Ill.

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Connellsville Mfg. & Mine Supply Co., Connellsville, Pa.
The Jeffrey Mfg. Company, 958-99 North 4th St., Columbus, Ohio.
Link-Belt Co., 300 W. Pershing Rd., Chicago, Ill.
Roberts & Schaefer Co., Wrigley Bldg., Chicago, Ill.

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Conveyor Sales Co., Inc., 299 Broadway, New York City.
Goodman Mfg. Co., Halsted St. and 48th Place, Chicago, Ill.
The Jeffrey Mfg. Company, 958-99 North 4th St., Columbus, Ohio.
Link-Belt Co., 300 W. Pershing Rd., Chicago, Ill.

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Goodman Mfg. Co., Halsted St. and 48th Pl., Chicago, Ill.
The Jeffrey Mfg. Company, 958-99 North 4th St., Columbus, Ohio.

LOCOMOTIVES, GASOLINE
Vulcan Iron Works, Wilkes-Barre, Pa.

LOCOMOTIVES, RACK RAIL
Goodman Mfg. Co., Halsted St. and 48th Pl., Chicago, Ill.

LOCOMOTIVES, STEAM
Vulcan Iron Works, Wilkes-Barre, Pa.

LOCOMOTIVES, STORAGE BATTERY
Goodman Mfg. Co., Halsted St. and 48th Pl., Chicago, Ill.
The Jeffrey Mfg. Company, 958-99 North 4th St., Columbus, Ohio.

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MINE SIGNALS
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du Pont Powder Co., The E. I., Wilmington, Del.
Hercules Powder Co., Wilmington, Del.

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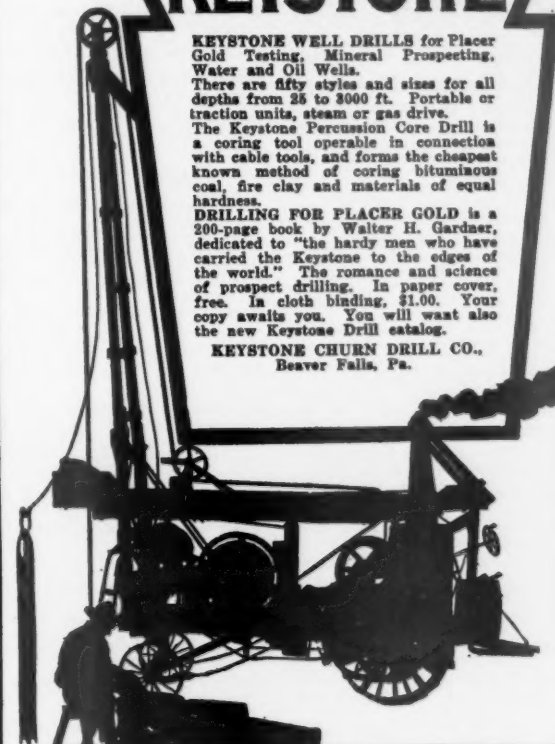
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Link-Belt Co., 300 W. Pershing Rd., Chicago, Ill.

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Keystone Lubricating Co., Philadelphia, Pa.

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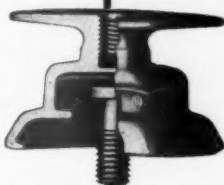
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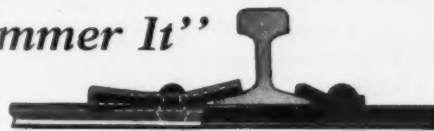
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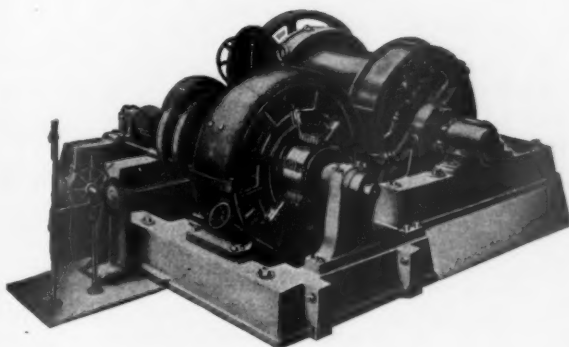
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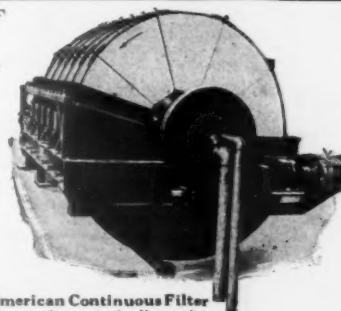
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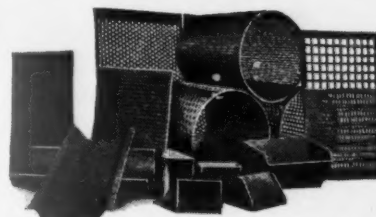
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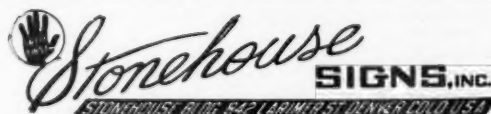
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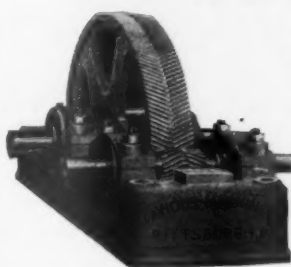
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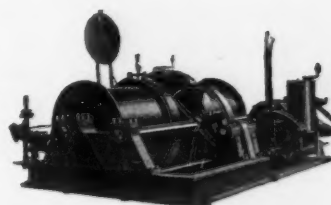
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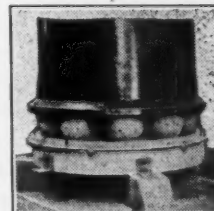
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You Are the Only Man Who Can Answer this Question

ARE you getting what you ought to get out of today's market?—in other words, are you selling all the coal you can produce; and, are you getting premium prices for what you do sell?

For, coal quality is a thing greatly misunderstood and often abused.

One may be producing a coal of extremely fine inherent quality—to be so poorly prepared as to render it a *product* of poor quality.

Nothing can be done to enhance the inherent quality of coal. Mother Nature has been and is the last word on that—but,

Where free impurities exist, and when these are not easily taken out in the mine, you *can* enhance the market value of the product to such an extent as to make possible continuous operation at prices above those of the normal market.

In short—we recommend, based on years of experience the Link-Belt method of "Wet Concentration" a system of preparation, whereby the ash content of the prepared coal is definitely controlled, and, according to its specific gravity, the results guaranteed.

Continued on the next pages.

LINK-BELT COMPANY

Leading Manufacturers of Elevating, Conveying and Power Transmission Chains and Machinery

PHILADELPHIA, 2045 Hunting Park Ave.

Pittsburgh - - - - - 335 Fifth Ave.

St. Louis - - - - - 3638 Olive St.

CHICAGO, 300 W. Pershing Road

Wilkes-Barre - - - - - 826 2nd National Bank Bldg.

Huntington, W. Va. - - Robeson-Prichard Bldg.

INDIANAPOLIS, 200 S. Belmont Ave.

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LINK-BELT

Coal Mining Machinery

The Ash Content of Coal Wet Concentration



General View of the Tipple and Washery of the Pocahontas Fuel Co., Inc., Sagamore Plant, McComas, West Virginia.



Link-Belt Basket-type jigs in the Jenkin-Jones Washery of the Pocahontas Fuel Corporation, Inc., Jenkin-Jones, W. Va.

COAL from the Pocahontas No. 3 Seam, mined by Pocahontas Fuel Co., Inc., is fed to a cross-over dump by a chain car feeder. From the dump hopper the coal is fed to an apron conveyor, which carries directly to hanger type shaking screens, making lump and egg sizes.

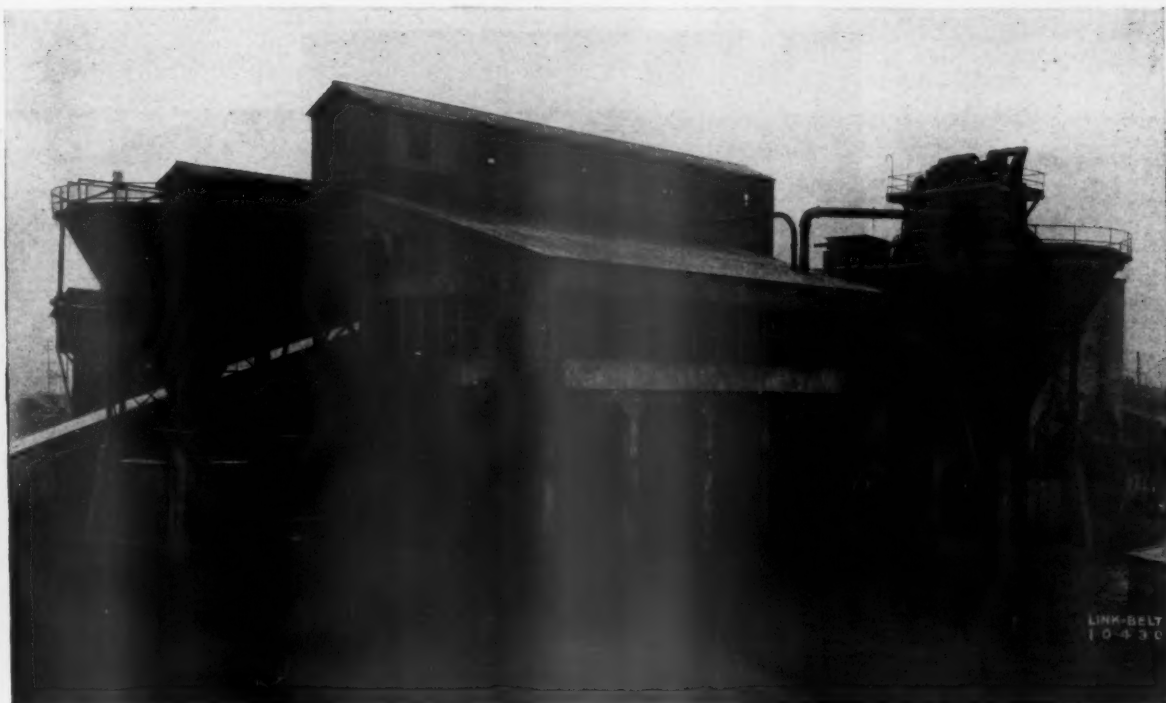
Coal 3" and under is sent to the washery for concentration of the free impurities from good coal. The cleaned coal is recovered and after sizing is loaded direct into washed coal bins.

This plant has a capacity of 300 tons per hour. The nearest Link-Belt Engineer will be glad to tell you more of this interesting installation.

LINK-BELT

Tipples and Washeries

Prepared by the Link-Belt Method is Guaranteed!



The Link-Belt Washery of the Woodward Iron Company, Woodward Alabama, preparing Coal for Metallurgical Coke.

PERHAPS the most exacting demands for well prepared coal come from those who use it for metallurgical coke. The ash content must be low, and unvariable.

The Woodward Iron Company, at Woodward, Alabama, prepare coal shipped in from their mines in hopper bottom cars. These cars are dumped from an elevated track into a bin, from which the coal is withdrawn through one or more of thirty-four gates to a steel apron conveyor, discharging to two Bradford Breakers for economical crushing.

Another conveyor reclaim the coal from the breakers and delivers it to the Link-Belt System of "Wet Concentration".

All circulating water in the main system is handled through a closed system where fines are recovered, and the wash water purified. Ask the nearest Link-Belt Engineer to explain this system thoroughly to you.



The Link-Belt Overstrom Concentrating Table is one of the most simple tables ever constructed, and is unequalled in its capacity and recovery.

LINK-BELT

and Washeries

There Are Times When We Advocate Dry Cleaning



Spiralizers for the Dry Cleaning of Small Sized Coal in the Plant of the Spring Canyon Coal Company.

THE experience of Link-Belt Engineers in the dry cleaning of coal extends back to 1902, when we built the first successful plant for the dry mechanical separation of coal.

Since that time we have built a number of these plants, the largest of which are four which we constructed for the Old Ben Coal Corporation in Southern Illinois.

Our latest plant installation is that of the Spring Canyon Coal Co., Spring Canyon, Utah, the owners of which pronounce it an unqualified success.

May we send you a copy of our book: "A Modern Utah Tipple and Dry Cleaning Plant"? Ask for Book No. 835.

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LINK-BELT

Coal Mining Machinery

This Year's Topics Were Selected by THE INDUSTRY Itself.

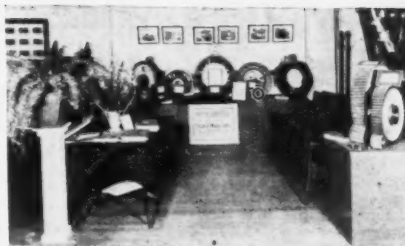


COAL PREPARATION — wet and dry methods — will occupy three sessions of this year's discussions, *mechanical loading* three sessions, developments in *mine safety* and *cutting and shooting* each one session.

Following a nation-wide poll of the subjects of most concern to the operators, the working out of this program has been developed by 60 prominent men from 17 states, under the leadership of Mr. Ezra Van Horn of the Clarkson Coal Company of Cleveland, Ohio.

Send for the full program.

CINCINNATI, OHIO, MAY 16-20



Suggestions that may be helpful

LET us send you the full program so far as it has been completed. It will outline more fully the manner in which these important topics are to be developed in the discussions.

REDUCED FARE. One and one-half fare on the "Identification Certificate" plan will apply for the round trip to Cincinnati, Ohio, for this convention. Write to the Convention Manager, The American Mining Congress, Munsey Building, Washington, D. C., for an IDENTIFICATION CERTIFICATE and instructions on how to proceed to take advantage of this reduced rate. Be sure to send names of all who are to travel on these certificates. *This is important.*

IMPROVED FACILITIES. This year's discussions will be held in a new auditorium specially constructed for the purpose in the south wing of the Music Hall. A dining room has been provided this year on the premises and this obviates the time-consuming trip back to the hotels and the center of town at noon. Forty-two additional booths have been provided and most of the space is already sold.

This year's Convention and Exposition promise in every important way to eclipse and be of more value than the former successful shows.

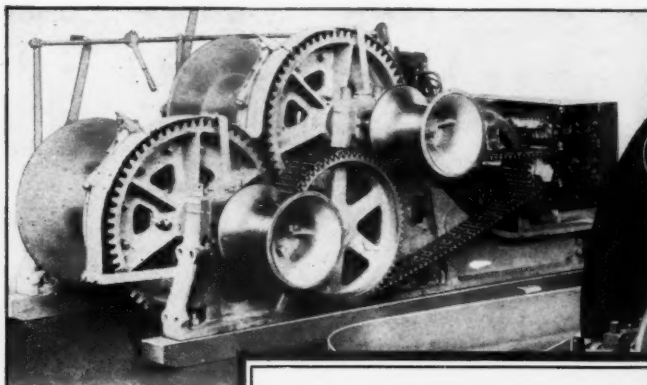
Plan now to attend and send all your key men. It will be a profitable investment.

For further information and reduced fare certificates address

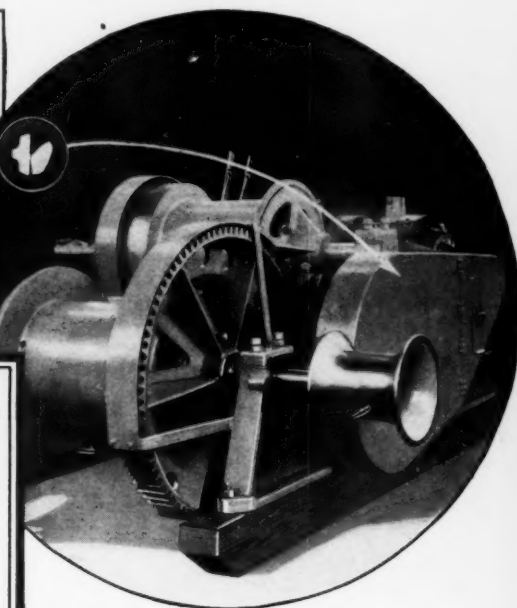
The American Mining Congress
841 Munsey Building
Washington, D. C.

The Fourth Annual COAL CONVENTION And EXPOSITION

MORSE DRIVES *give sure power* to MEAD-MORRISON MACHINERY



Above and at right, two views of Mead-Morrison Electric Hoist equipped with Morse Silent Chain Drives ranging from 40 to 80 H. P.

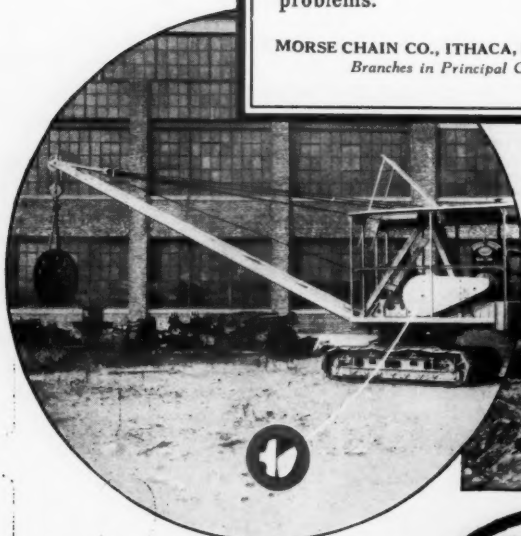


TUGGING, pulling, meeting sudden load changes, Mead-Morrison handling equipment "stands up under hard continuous usage due to careful design and extreme ruggedness" for which this equipment is known. Morse drives are flexible—they easily absorb shocks and sudden overloads. Positive speed ratios, 98.6% sustained efficiency, adaptability to short centers—these are a few of the advantages of Morse Silent Chain Drives.

Consult a Morse Transmission Engineer in solving your power problems.

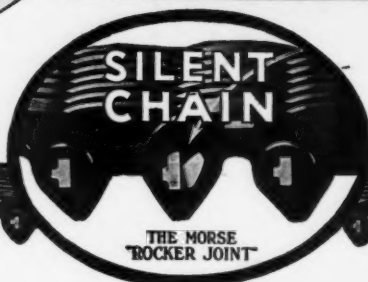
MORSE CHAIN CO., ITHACA, N. Y., U. S. A.
Branches in Principal Cities

Below and at left, two views of Mead-Morrison Crawler Crane equipped with 35 H. P. Morse Silent Chain driving from 4 cylinder gasoline engine.



Ⓢ-1700

MORSE



DRIVES

